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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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The Outlook

The Royal Air Force

AFTER last year's Royal Air Force Display the Air Council decided, in view of the expansion and the difficulty of staging "spectacular" shows at Hendon representative of the work of the modern R.A.F., to abandon the display. Interest now centres on Empire Air Day, and *Flight* offers its readers a comprehensive review of the constitution, organisation, and work of the Royal Air Force in connection with that nation-wide event, which is being held next Saturday.

Our readers will see for themselves, at the R.A.F. stations which they elect to visit on Saturday, the kind of work on which the different units are engaged, and will be able to form their own opinions of the quality of that work. Since, however, it is difficult to obtain, from a visit to any one station, a clear picture of the multifarious duties of the entire R.A.F., we publish this week articles on the organisation of the Service and on the work of certain units selected as being typical of their class.

The present strength of that part of the Royal Air Force which most closely concerns people at home includes 25 Fighter Squadrons, 71 Regular Bomber Squadrons (counting-in two bomber-transport squadrons), 19 Squadrons in the Auxiliary Air Force (of which 11 are Bomber Squadrons, 5 Fighter Squadrons, and 3 Army Co-operation Squadrons), and 17 General Reconnaissance Squadrons.

When estimating the strength of what is somewhat misleadingly termed the "Metropolitan Air Force," the Air Ministry is in the habit of including the 12 Army Co-operation Squadrons. This practice is obviously open to criticism, as these squadrons would, in time of war, be at work with the Army and would not, therefore, be available for home defence. Of the 71 Bomber Squadrons considerable numbers are stationed overseas, while many of those stationed at home are far from being up to full squadron strength.

Training of pilots is likely to be the "bottle-neck" which limits the rate of expansion, and the present 11 Flying Training Schools will not suffice. Their number is to be increased, as is also the 22 civil flying schools at which flying is taught *ab initio*. Already three new additions have been announced.

A Good Beginning

THE new Air Minister has started well. His first public task was to explain the manner in which it is intended to divide the £1¼ million extra help to civil aviation. One of his first actions after taking office was to make the acquaintance of representatives of the British aircraft industry at a meeting of the S.B.A.C. Sir Kingsley Wood will have to be judged by his actions, but in the meantime it promises well for the future of British aviation that he created a very favourable impression on those members of the industry who met him in person for the first time. His friendly and unassuming manner promised a future co-operation with the industry which should go far towards overcoming the difficulties with which both the industry and the Air Ministry will be faced during the next few years.

On the civil side Sir Kingsley starts well, with a reputation established at the Post Office when the Empire air mail scheme was planned.

Equally to be welcomed is the Air Ministry's announcement that Lord Nuffield has had an interview with the Secretary of State for Air, and that he has placed his services at the disposal of the Air Ministry.

It will be recollected that at the time of the formation of the shadow factories Lord Nuffield could not see eye to eye with Lord Swinton, and that he strongly held the view that it was a mistake for aero engines to have their separate parts manufactured by several different companies. Lord Nuffield considered that the right policy would be to let a number of different firms manufacture complete engines. As it has turned out, aero engine production is ahead of airframe manufacture, but that is to some extent due to delays in aircraft manufacture rather than to unexpectedly rapid production of engines.

So perhaps Lord Nuffield was right to some extent. Be that as it may, it is indeed good news that his great manufacturing resources are to be taken into use. How that is to come about has not yet been announced, but it seems to be the general view in the industry that another aircraft factory will be established rather than an engine factory. Certainly that would be the logical line of attack on production problems.

A Special message to "Flight" from:—

Sir Kingsley Wood

Secretary of State for Air

I hope that as many members of the public as possible will take the opportunity on Empire Air Day to visit a Royal Air Force Station, because it is right that the public should get to know and understand the life of the Royal Air Force to-day.

During the last few years not only the size but the nature of the work of the Royal Air Force has changed out of all knowledge. The technical advances which have increased the range and fighting power of Service aeroplanes have immensely increased the scope and the complexity of Service training. A visit to one of the Stations which will be open on May 28 will show what is involved to-day in the training of pilots, aeroplane crews and maintenance staffs for the Royal Air Force. The effort which that training needs, when combined with the task of carrying out an expansion unprecedented in peace-time, is one which few Services have been called upon to make. I am proud to be associated with a Service which is undertaking both confidently and vigorously so great a task, and I am determined to do all that lies within my power to bring these efforts to success.

Designing for Production

THERE are many experienced manufacturers who hold the view that the delay in shadow factory airframe production is mainly due to the fact that the machines selected for shadow production were not originally designed with large-quantity output chiefly in mind. As there must in any case be a considerable delay before any factory erected or adapted by Lord Nuffield could get into production, would it not be a good idea to design an aircraft specially for the Nuffield factory? What we mean is that if Lord Nuffield's production engineers could be in close consultation with the selected aircraft designers, it might quite well be possible to design a type of airframe which was little if any inferior to those designed without primary regard to production problems. In that way the detail design of what we may, without disrespect to Lord Nuffield, call the "Morris Military Machine," could be finished by the time the factory for its production was ready. The present shadow factories had perforce to make a start with types not specially designed for production. This would seem to be a good opportunity for attacking the problem from a different angle.

Incidentally, there is a story worth telling of an estimate made recently by a well-known aircraft firm. The firm in question has had in its works for years, as a sort of souvenir, a complete S.E.5 airframe. Careful estimates were made of the rate of output which the works in question might achieve if, with their present facilities, they were put on to manufacturing S.E.5s. Assuming the necessary supplies of wood to be available, the engineers arrived at the conclusion that the S.E.5 could be turned out at the rate of *one complete airframe every ten minutes*.

That sounds almost fantastic. But it should be remembered that the S.E.5, of mixed construction, was equipped with some six instruments and two guns. That was all. Compare it with the Hurricane, for example, with its eight guns, their operating gear, the night and day flying equipment, retractable undercarriage, wireless, and so forth, and one begins to see why modern production is slow. The figure of ten minutes is probably quite reasonable.

Cadman Implementation

LAST week's Debate on the Air Navigation (Financial Provisions) Bill brought to light a *volte face* by the Government on the subject of subsidising internal airlines. In this connection, perhaps, the remark of the new Secretary of State for Air was significant. Sir Kingsley Wood said "I would like to say a word about the inland services, *in which I was very much interested when I was at the Post Office*. We propose to devote some £100,000 to the inland services, and we hope thus to help those companies which are suffering losses to establish themselves on a sound commercial footing and to enable them to press on with their services with even greater enterprise." The italics are ours.

In the "Observations of His Majesty's Government" which accompanied the Cadman Report, it will be remembered, the Government agreed with the Maybury Committee and the Cadman Committee that subsidies should not be paid to internal air route companies. It is, therefore, legitimate to assume that the change in outlook is not unconnected with the change in Air Ministers, and it may be taken as something of a good omen that the first official action of Sir Kingsley Wood in Parliament after taking over his new post was to move the second reading of the Air Navigation Bill.

The long debate on the Bill is reported elsewhere in this issue. The outstanding features of the Bill is that it proposes to spend, out of the £1½ million extra sanctioned in accordance with the Cadman recommendations, £1 million on the extra-European services, i.e., mainly on the Empire routes, some £400,000 on the London-Europe services, and £100,000 on the inland services.

These figures give an indication of the relative importance attached by the Government to the Empire, European and inland air services. It might be argued that while obviously the Empire routes have first and greatest claim, there is a rather disproportionate differentiation between the European routes and the internal routes. The former will receive four times as much help as the latter.

While agreeing with the Government's view that the European services should be helped to uphold British prestige abroad, it is a little difficult to see how that is going to be done with foreign aircraft. And it will be a year or more before the new De Havilland 95 can be produced, type-tested and put on the routes in quantities. The first two Albatross monoplanes by the same firm have been earmarked for long-distance trans-oceanic flights, and the five ordered by Imperial Airways will not be ready for the routes for some time. That being so, it does rather appear that for the first year or two the subsidies might have been divided a little less unevenly.

The Northern Route

WHILE the general scheme of the Government's proposed division of subsidies does not appear open to criticism, there is one firm which seems to have claim to special consideration. Allied Airways started their Newcastle-Stavanger service with an official introduction to the Norwegian Government from the British Air Ministry. The service has operated during summer

months with good regularity, and recently the company has renewed its contract with the Government of Norway.

For some extraordinary reason, the name of this company was not supplied to the Cadman Committee, and consequently the Committee was unable to report on it. Under the new Bill, it will not be eligible to receive a subsidy. The effect may well be that the Norwegian Government will reason that if the company receives no subsidy it must be because it does not deserve one. Actually, there is much to be said for a northern route to Scandinavia. Serving as it does the northern parts of the British Isles by the most direct route, it is fulfilling a useful purpose. Should the line be compelled to close down, passengers from the north would be compelled to travel to London first and thence to Scandinavia, and a good deal of time would be lost.

There is also the consideration that in time of war the northern route might be of considerable strategic value. It is conceivable that the route across Holland might become impracticable, and a northern alternative route might be extremely useful. As Sir Kingsley Wood's attention may not have been drawn to these facts, *Flight* ventures to do so.

Hispanos for R.A.F.?

WITHOUT wishing to appear hypercritical, we do feel that the Air League, which has done such excellent work in organising Empire Air Day, might have been a little more watchful of technical verisimilitude. For instance, the E.A.D. poster is by now well known and that its primary object of attracting notice has been achieved can hardly be doubted; but the fact remains that, to the technical eye, it jars as sickeningly as would a Royal Tournament poster depicting a Life Guard wearing suede shoes.

The design centres round a hypothetical single-seater fighter standing on the ground. It has a French Hispano Suiza engine; it has a Dowty undercarriage with internally sprung wheels, like the Gladiator. All very nice except for the fact that the machine is a low-wing monoplane and would require a track of about double the width; the cantilever wing looks badly in need of external bracing; and despite the "hot stuff" air of the machine the cockpit has no enclosure. Obviously the artist has seized on a picture of the Spanish Fury and carefully eliminated the top wing. May we suggest that next year technical accuracy as well as artistic merit be considered by the judges of the poster competition?

HIS MAJESTY KING GEORGE VI,
Marshal of the Royal Air Force,
Air Commodore in Chief, Auxiliary Air Force.
Photo: Walter Stoneman.

Frankness and Accidents

THERE was a time when some justification might have been found for secrecy and silence about the facts of, and the reasons for, flying accidents. Nowadays there can be no justification except, perhaps, that of saving the good names of pilots and/or constructors. Free and fair comment and explanation, published without an unreasonable time-lag after every incident or accident, would be better for all concerned. Not only would other pilots and constructors learn something useful from the report, but the general public would be less liable to lose confidence if it was told, in the case of transport accidents, exactly why a particular mishap occurred.

Not very long ago an accident occurred in America to a machine which was of new design, and the report, which could be read by all and sundry in the *Bureau of Air Commerce Bulletin*, quite frankly gave the reason for the accident as that of structural failure. In the meantime, and before the report had been published, all the machines of the particular type concerned had been withdrawn from service and the necessary modifications had been made. Now the type is in full service again, and no one has any feeling of doubt about its safety. In this country it is doubtful if, even now, had a similar accident occurred at the same time, we should have seen the report, and this report would probably have been far less explicit and detailed than that published by the American authorities.

The same might be said of purely domestic incidents of airline operation. When, for instance, engine failure is experienced it would do little harm and probably a great deal of good for the company concerned to publish the fullest possible details rather than to leave the public with the unpleasant feeling that such and such a machine or company is, in some vague fashion, unsafe.

We are accustomed to the idea that the public should normally hear the fullest details of the reasons for accidents to surface transport vehicles, yet the same public is not considered fit to know the real story behind even the most unimportant airline incident.

THE EXPANDED ROYAL AIR FORCE

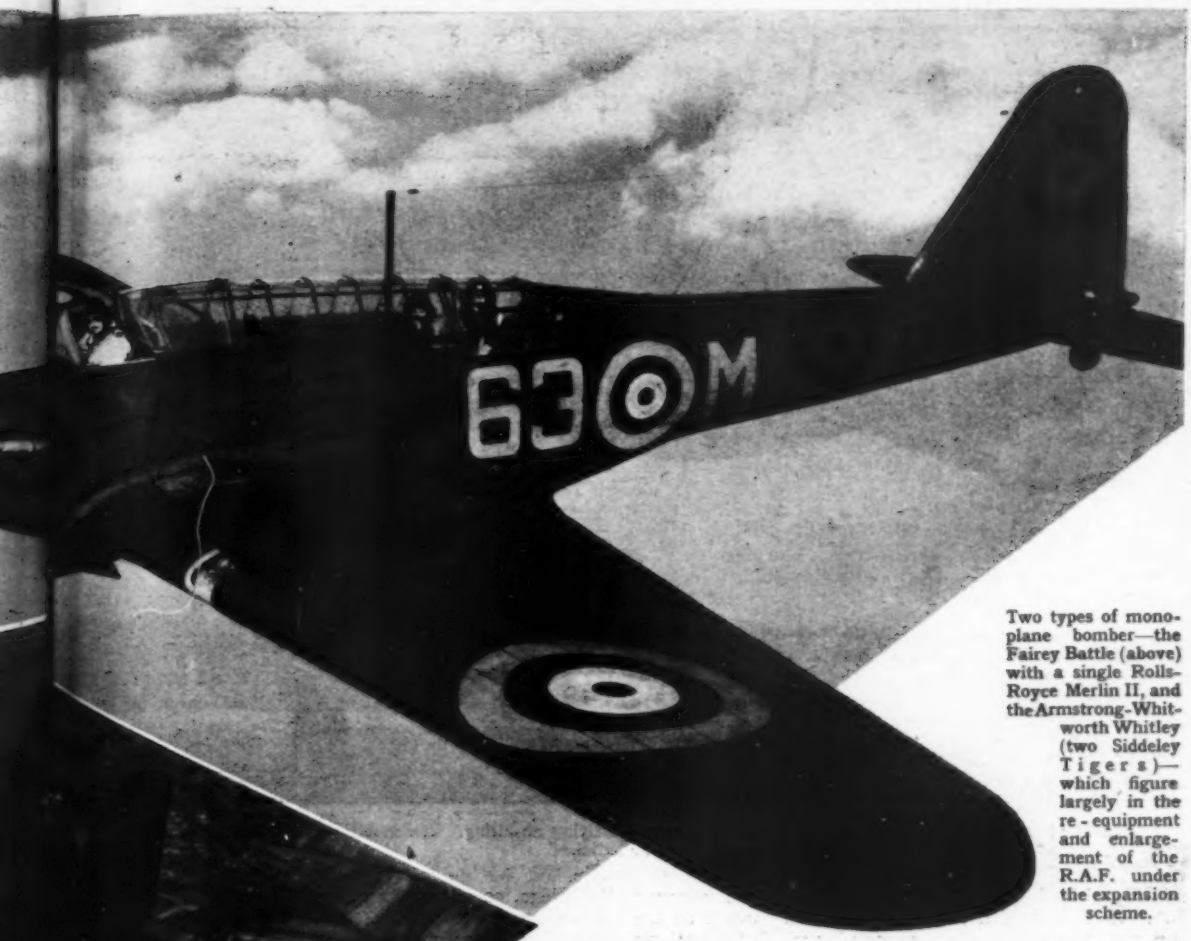
Its Constitution and Administration Simply Explained : Ranks : The Various Commands : Home Defence

By MAJOR F. A. de V. ROBERTSON, V.D.

NEXT Saturday, Empire Air Day, the public will see the Royal Air Force "at home." Visitors to Service aerodromes will meet personnel and be shown aircraft, equipment, armament, hangars and barracks. They will see and learn much. But will they understand the vastness and complexity of the organisation which lies behind these outward manifestations? Many people actively engaged in aviation of one form or another are comparatively ignorant as to details of the constitution and administration of the Royal Air Force.

First of all, it must be realised that, almost without exception, when a Service aircraft takes off and flies, it flies for some definite purpose connected with the defence of the country and the Empire.

There are still plenty of veterans of the Great War in our midst, and they know well that the Government could not carry on the war by simply raising regiments and sending them across the Channel to fight the enemy. They had to be organised in brigades, divisions, corps and armies. The Royal Air Force has to be organised on somewhat the same lines, though that is seldom



Two types of monoplane bomber—the Fairey Battle (above) with a single Rolls-Royce Merlin II, and the Armstrong-Whitworth Whitley (two Siddeley Tigers)—which figure largely in the re-equipment and enlargement of the R.A.F. under the expansion scheme.

explained to the man in the street. Yet it would certainly be a good thing for the public in general to know something about this organisation.

To this the careful reader may reply that *Flight* has already dealt with this subject in past years. That is true; but, since the expansion was started, the organisation of the R.A.F. has been considerably altered, and so the time has come for a new attempt at explanation.

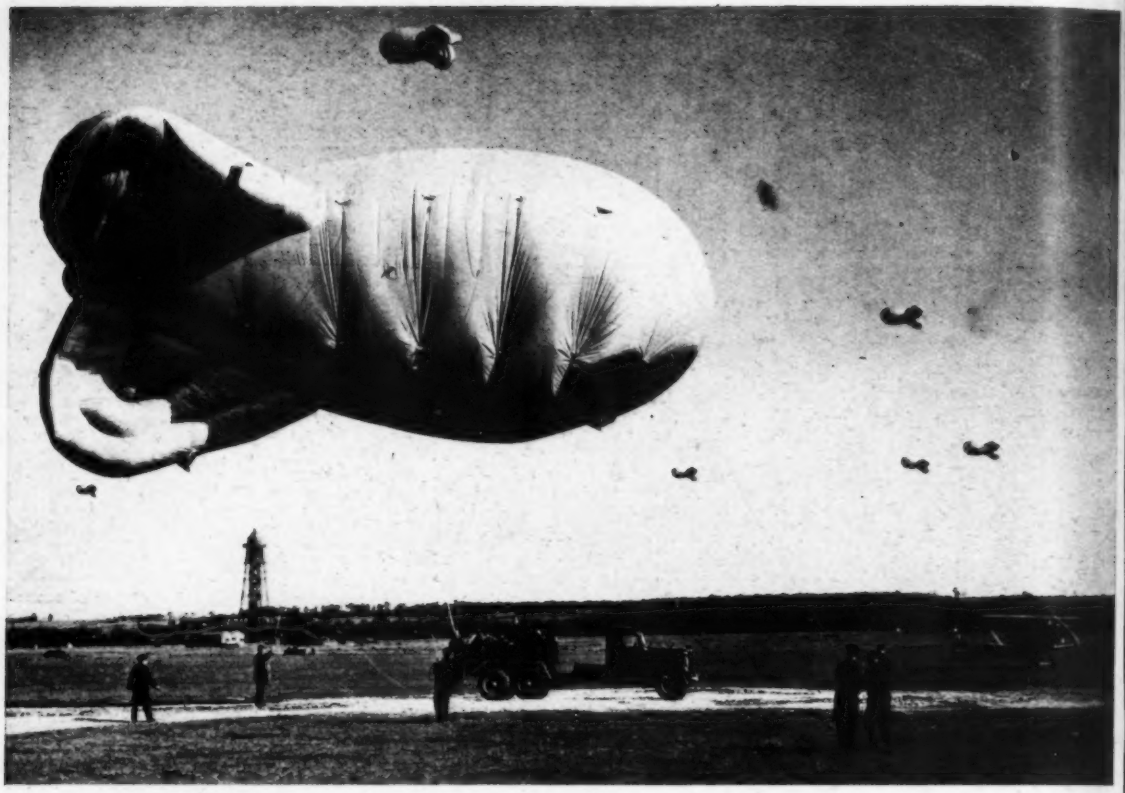
Let us begin at the beginning and explain the ranks in the R.A.F., for they are not yet as familiar generally as those of the Navy and the Army. The ordinary airman is either an aircraftman 2nd class, an aircraftman 1st class or a leading aircraftman—never "aircraftsman." The leading aircraftman (L.A/C., for short) corresponds roughly to a lance-corporal in the Army, and wears an airscrew embroidered on his sleeve. The non-commissioned ranks are the same as those of the Army, corporal and sergeant, with the addition of flight sergeant, which is something like colour-sergeant in the Army.

The ranks of the officers resemble more nearly those of the Navy. All the titles of rank consist of two or more words. Starting at the bottom, the ranks are: Pilot Officer, Flying Officer, Flight Lieutenant, Squadron Leader, Wing Commander, Group Captain, Air Commodore, Air Vice-Marshal, Air Marshal, Air Chief Marshal, and Marshal of the Royal Air Force. It may be noted that Flight Lieutenant, Wing Commander, Group Captain and Air Commodore correspond exactly with the naval ranks of Lieutenant, Commander, Captain and Commodore.

Instead of the regiments, brigades, etc., of the Army, the R.A.F. has, or can have, squadrons, wings, groups, areas and commands. The squadron is the unit, though it is usually subdivided into two or three flights. The nearest equivalent to a squadron is a battery of the Royal Artillery, and both these units are commanded by officers of corresponding rank: Squadron Leader and Major. The squadron is a permanent organisation, whereas wings, groups, areas and commands can be brought into being or dispersed as the need arises. At present there are no existing wings in the British Isles, but there are three R.A.F. wings in India. Before the expansion began there were several areas in Great Britain, but now the term has been dropped for the time being. The squadrons and other units are formed into groups, and the groups into commands. Each group is under an officer known as an Air Officer Commanding (A.O.C.), and each command is under an Air Officer Commanding-in-Chief. It is really a very simple organisation.

Let us examine the Home commands. There are four of them, entitled Bomber, Fighter, Coastal and Training. The first three are operational commands, and in time of war would be concerned with aircraft as a means of helping to win the war.

The Bomber Command is given pride of place because the Air Force regards the bomb as its most important weapon. That does not mean that it contemplates slaughtering women, children and other civilians as Spanish and Japanese bombers have recently been doing. War on non-combatants is no part of the doctrine of the R.A.F. Its staff college at Andover teaches the doctrine of the



Equipment of the new Balloon Barrage Group at Cardington receiving an airing. The mooring cables in war time would be rendered lethal.

military objective. The bomber is, in fact, a long-range gun. Its contribution to a national victory would be the destruction of anything and everything which the artillery would shell if its guns could reach it, but which is out of the range of even the most modern gun. One has often seen poetically-minded writers speak of air squadrons as "cavalry of the clouds." A better description of the prime function of the Royal Air Force would be "artillery of the air."

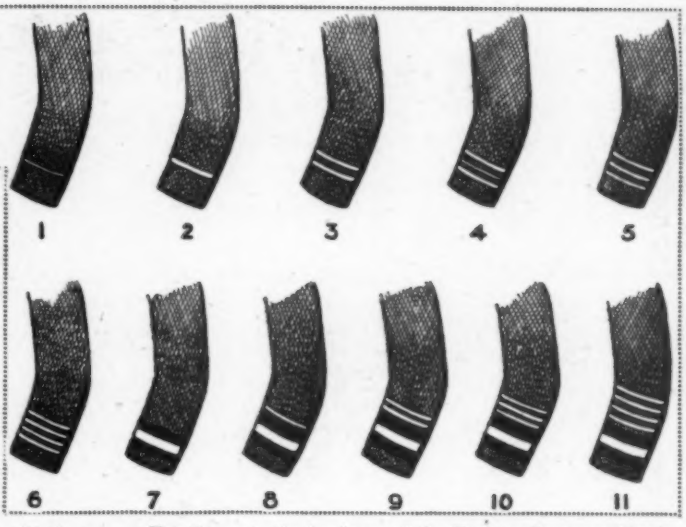
The Bomber Command, whose headquarters are at Uxbridge, comprises six groups, five of which are regular while one is composed of squadrons of the Auxiliary Air Force. Perhaps in time the term No. 6 (Auxiliary) Group will be changed, because there are now a number of Auxiliary squadrons whose function is either fighting or army co-operation, and which therefore are not included in this particular group.

"Flight" photograph.

Pilots of No. 3 (F.) Squadron, Kenley, discuss formation flying in the presence of friends. The Squadron is armed with Hurricanes.

The five regular Groups will, no doubt, ultimately be arranged in some coherent order, some being groups of heavy bomber squadrons, some of medium bomber squadrons and some of light bomber squadrons—if, indeed, the light bomber is destined to persist as a class, which seems doubtful. Also, it may be presumed that in due course the groups will each cover some particular tract of country, so that the stations in each will not be too far apart, and the squadrons in each group will be able to work together easily. At present we find No. 4 (Bomber) Group with headquarters at Linton-upon-Ouse, York, administering stations so far apart as Finningley, near Doncaster, and Boscombe Down, on the edge of Salisbury Plain. We must remember that the expansion of the R.A.F. is not yet complete. Many new stations are being built, and in the meantime there must be some makeshift temporary arrangements. One very sensible tendency can be discerned, namely, the grouping of the heavy bomber squadrons in the northern part of the kingdom. The heavy bombers must needs have the longest range, and therefore can afford to live farther away from the south coast. There is also a possibility, if the worst comes to the worst, of their having to strike out across the North Sea, in which case they would be well placed, and would waste a minimum of petrol in flying over friendly country. More than any other class of squadron, the heavies need to be expert at finding their way out and home through bad weather, and in the North they have plenty of practice in that art.

It would hardly be profitable to give a list of the stations in each bomber group, as the present arrangement will doubtless be altered as new stations become habitable.



How rank is denoted in the Royal Air Force: (1) Pilot Officer. (2) Flying Officer. (3) Flight Lieutenant. (4) Squadron Leader. (5) Wing Commander. (6) Group Captain. (7) Air Commodore. (8) Air Vice-Marshal. (9) Air Marshal. (10) Air Chief Marshal. (11) Marshal of the Royal Air Force.

It will suffice to mention that the headquarters of No. 1 (Bomber) Group are at Abingdon, No. 2 at Andover, No. 3 at Mildenhall, No. 4 at Linton-upon-Ouse, No. 5 at Grantham, and No. 6 (Auxiliary) in London. Because of its position, No. 6 Group administers the Air Ministry Wireless Section as a matter of convenience. Likewise No. 2 Group administers the R.A.F. Staff College at Andover. The Auxiliary bomber squadrons are spread all over the country, from Kent and Gloucester in the South to Edinburgh and Glasgow beyond the Border.

The Fighter Command has its headquarters at Stanmore, in Middlesex. Its A.O.C.-in-C. has under him Nos. 11 and 12 (Fighter) Groups, No. 22 (Army Co-operation) Group, No. 30 (Balloon Barrage) Group, and the Observer Corps. He is also in operational command of all the searchlight battalions and anti-aircraft brigades of the Territorial Army.

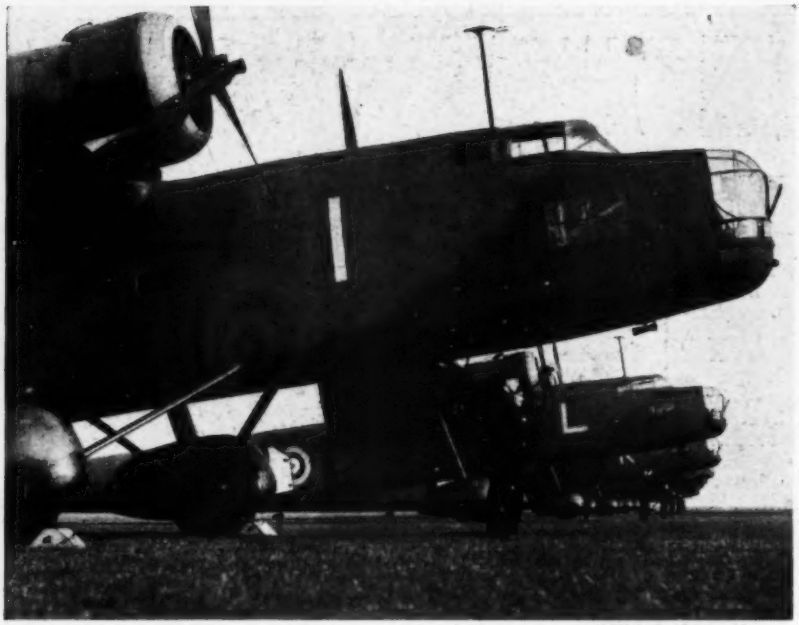
Heterogeneity

This seems a very heterogeneous sort of command, and it needs some examination and explanation. In the first place one may ask why the Army Co-operation Group is part of the Fighter Command. Well, that group has to be in some command, and, as the Bomber Command is a bigger affair than the Fighter Command, it is simpler to charge the latter rather than the former with the administration of this group. But the Fighter Command does not control the operations of the Army Co-operation squadrons. They work entirely with the Army and their operations are controlled by Army commanders. If the Army went overseas in time of war these A.C. squadrons would go with it; and it must be clearly understood that they are not available to take part in the air defence of the country. In fact, they are not trained for that sort of work. Their main function is to reconnoitre for the Army and to spot for the artillery. It is very specialised work, and the pilots have to be very carefully trained for it. They also fly (or will do so when re-equipment is completed) specially designed aeroplanes. The standard types for Army work are now the Hawker Hector and Westland Lysander. As No. 22 Group is concerned more with the Army than with the essential functions of the Air Force, we will leave it out of further consideration.

For the rest, the business of the Fighter Command is the air defence of the country against bombing raids by an enemy. For that reason all the elements of air defence are concentrated in the one command. The Observer Corps gives the first warning of raiders crossing the coast and traces their course until they come into the zone where the anti-aircraft guns will engage them. By night the searchlights will also get to work. The squadrons of the fighter groups are the chief striking force, and when the observers (and by night the searchlights) have made known the position of the raiders, and the guns have driven them up high, frayed the nerves of the bomber pilots, possibly broken up the formations, and taken perhaps, a toll of machines shot down by shell-fire, the fighter squadrons will come into action. Their aeroplanes are the fastest machines which the wit of our designers can contrive, and soon all these squadrons will be able to fly at well over 300 m.p.h. They are also heavily armed, and will be able to bring a great weight of fire to bear upon the raiders. During the Great War pilots like Mannock, Ball, and McCudden had to learn the art of fighting for themselves, and the only practice they got was by actual combats with the enemy. Very many young pilots in fighter squadrons were shot down in those days before they had acquired the experience which would have saved them.

Gauntlet single-seater fighters being put to bed in Bessoneau hangars at No. 3 Armament Training Station, Sutton Bridge. The transportable Bessoneau hangar, which was of great service during the war, still has its uses in the R.A.F. to-day.

"Flight" photograph.



"*Flight*" photograph.

Handley Page Harrow long-range bombers, showing the installation of the Nash and Thompson power-driven turret in the nose.

Now all that has been changed. The pilots of the fighter squadrons are most highly trained in every device of air fighting. Different forms of tactics for attacking bomber formations or single machines are constantly being thought out, experimented with, and practised. When a leader of a fighter flight orders a certain form of attack, every pilot in the flight knows exactly what he has to do and how to do it. For instance, one form of attack will be suitable for bombers in a clear sky, another will be effective against bombers flying just above a cloud bank, and yet another when the raiders are below the clouds. All the fighter machines are equipped with wireless telephony, and if the ground organisation finds that a certain raid has changed its direction, the fighter patrol can be immediately told of the change, and can fly off to search in the new direction. Likewise the leader can talk to his pilots and tell them which form of attack he intends to make.

Defence of London

No. 11 (Fighter) Group is destined especially for the defence of London, including the Thames estuary. Naturally it was the first fighter group to be properly organised. Its aerodromes are arranged in a rough circle round London. In Essex there are Debden (near Saffron Walden), Hornchurch, and North Weald; in Middlesex are Northolt and Hendon; in Surrey there is Kenley (also known as Whyteleafe); in Kent there are Biggin Hill and Hawkinge; and in Sussex there is Tangmere. Hawkinge and Tangmere are too near the coast to be of use to fighters in war, when depth of defence is needed. The squadrons from these two stations would probably be withdrawn to places nearer London. This group controls twenty fighter squadrons, seventeen of which are regulars and three belong to the Auxiliary Air Force. The headquarters of the group are at Uxbridge. It might be explained that considerably more than half of these squadrons are equipped with single-seater fighters.

For reasons of convenience this group also administers No. 24 (Communications) Squadron and the University of London Air Squadron, neither of which is an operational squadron.

No. 12 (Fighter) Group has been formed for the defence of the Midlands and North, and at present it cannot be called a fully fledged eagle. Its aerodromes are at Usworth in Durham, Catterick, Church Fenton (near Tadcaster), and Thornaby in Yorkshire; Digby in Lincoln; and Duxford in Cambridge; while one of its squadrons lives for the time being at Martlesham Heath in Suffolk, where it is probably a bit of a nuisance to the Aeroplane and Armament Experimental Establishment. The fighter squadrons in this group at present only number ten, two of which are Auxiliary Air Force units. The group also (again as a matter of convenience) administers the Cambridge University Air Squadron.

When the expansion has been completed, we may expect to see more than ten fighter squadrons allocated for the defence of the great industrial cities from Birmingham to Glasgow.

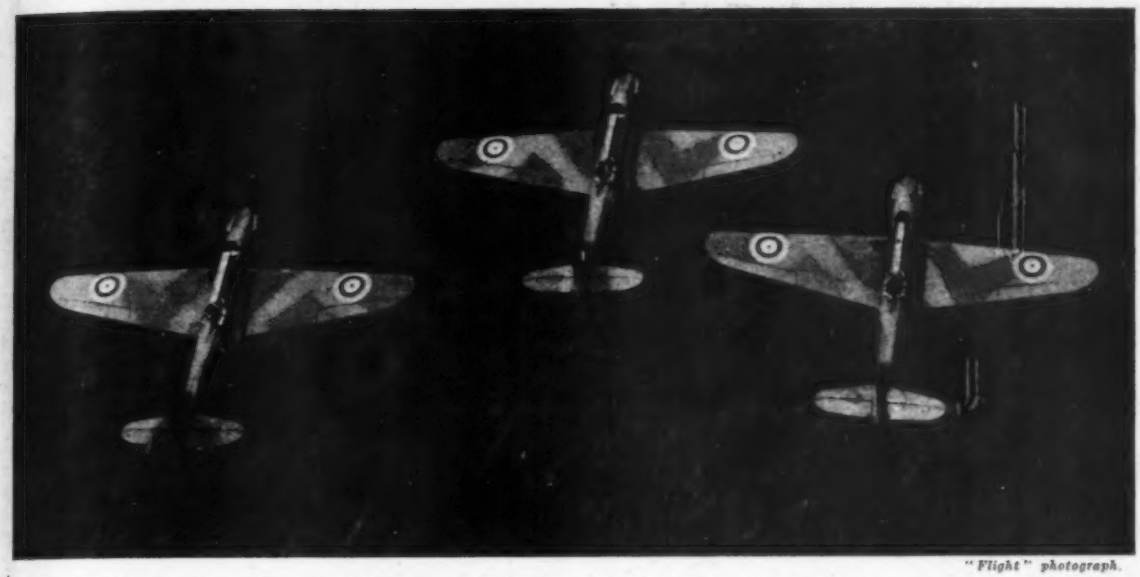
Finally, round or over the defended area soars the balloon barrage. Probably it will be more effective by night than by day. But so long as the balloons are up the style of the raiders will be very much

The air gunner in a Fairey Battle wields his Lewis for *Flight's* cameraman. The windscreen folds down to complete the line of the cockpit enclosure.

THE AIR COUNCIL.

Bomber Command.	Fighter Command.	Coastal Command.	Training Command.
No. 1 (B) Group.	No. 11 (F) Group.	No. 16 (Reconnaissance) Group.	No. 23 (T) Group.
No. 2 (B) Group.	No. 12 (F) Group.	No. 16 (Training) Group.	No. 24 (T) Group.
No. 3 (B) Group.	No. 22 (A.C.) Group.		No. 25 (Armament) Group.
No. 4 (B) Group.	No. 30 (Balloon Barrage) Group.		No. 26 (T) Group—Cranwell.
No. 5 (B) Group.			
No. 6 (Auxiliary) Group.			

Organisation of the Home Commands. Each Group administers a number of squadrons.



"Flight" photograph.

A flight of Battles of No. 142 (B.) Squadron about to release their bombs (practice variety) over an aerodrome target.

cramped. The balloon cables will not be interconnected, but each cable will, by some secret process, be made lethal, so that any aeroplane which touches a cable will be destroyed. No raiding pilot would ever venture, it may safely be said, to fly knowingly among the cables. His chance of coming out again unharmed would be too small to be worth considering. Therefore, if the balloons are known to be up, the raiders will have to fly above them. That means in the first place that there will be less air space for the fighters to search. In the second place it means that the bombs will have to be dropped from high up, and that makes it less likely that they will score bullseyes on their targets.

The civilian may very well exclaim in horror that a bomb which misses a munition factory will probably kill some civilians nearby. The killing of civilians is very deplorable, but it will not go any distance towards helping the enemy to win the war. The destruction of the factory might have been a serious handicap to our own forces; and if the bombs miss that factory the raid has failed of its purpose. In fact, a bomb which only kills civilians is a bomb wasted.

Divided Responsibility

The guns and searchlights of the Territorial Army come under the Fighter Command for operations, just as No. 22 (Army Co-operation) Group is operationally under the Army. The War Office and the Territorial Associations raise the battalions and brigades, clothe them, feed them, pay them, and equip them. But for fighting or manœuvres they take their orders from the A.O.C.-in-C., Fighter Command. It is for him to lay down where the guns and searchlights are to be placed. If the expeditionary force of the Army goes overseas and some Territorial divisions go with it, these guns and searchlights will stay at home to play their part in the air defence of the country. It cannot be called a satisfactory or logical arrangement that these batteries and battalions should have to serve two masters. At present it is considered to be working well, and the War Office, under the present War Minister, is giving precedence over everything else to the task of making these Territorial units absolutely fit for the very important part which they have to play in air defence. But it was not always so. Before the expansion began, the War Office neglected the Anti-Aircraft Territorials in a way which can only be described as dangerous. They were left with old patterns of guns, searchlights, sound-locators, and transport vehicles. Now that expansion and re-equipment are the order of the day every effort is being made to provide the latest equipment; but it has not always been easy to get the new weapons and instruments in a hurry.

Future A. A. Defence

There is also, of course, no guarantee that, once the present excitement is over, the War Office will not again neglect the anti-aircraft units. It is an anomaly that the Air Ministry, which has to command these units in war, should not be made responsible for equipping them in time of peace. Sooner or later the Government will surely come to recognise this, and will transfer these units completely from the War Office to the Air Ministry.

"What of the men?" This question from Conan Doyle's famous "Song of the Bow" is specially pertinent when applied to the Fighter Command. The men are (speaking in a military sense) of all sorts and conditions.

SECRETARY OF STATE

UNDER-SECRETARY.

Chief of the Air Staff.	Air Member for Personnel.	Air Member for Research and Development.	Air Member for Supply and Organisation.	Permanent Under-Secretary.
Director of Operations and Intelligence.	Director of Postings.	Director of Technical Development.	Director of Organisation.	Director of Accounts.
Director of Staff Duties.	Director of Personal Services.	Director of Scientific Research.	Director of Equipment.	Director of Contracts.
Director of Signals.	Director of Training.	Director of Aeronautical Inspection.	Director of Works.	Director of Meteorological Office.
	Director of Educational Services.	Director of Repair and Maintenance.	Director of Aeronautical Production.	
	Director of R.A.F. Medical Services.			

Organisation of the Air Ministry's Operational, Technical and other Departments.

Vickers Wellesley single-engined bombers (Pegasus XX). The Wellesley, although a "general purpose" type, equips the Long-Range Development Flight.

The fighter squadrons, for the most part, are manned by regulars of the Royal Air Force, but there are now three squadrons in No. 11 (Fighter) Group and two in No. 12 (Fighter) Group which belong to the Auxiliary Air Force and are manned by citizen officers and airmen. No. 30 (Balloon Barrage) Group is manned by the Auxiliary Air Force, except for the group staff, which is composed mainly of officers retired or on the reserve, with a very few serving regular officers. The Observer Corps is also organised by ex-officers of the regulars, mostly from the R.A.F., but some are from the Army, while the men who do the actual observing are civilians sworn in as special constables. They do not wear uniform, but sport a badge showing the device of a beacon—not of the Belisha variety, but emblematic of the fires which carried the news of the approaching Armada across England until "the red glare on Skiddaw roused the burghers of Carlisle." Most remarkable men are these Observers. They are mostly villagers, unpaid, of course, and not too frequently exercised, but full of enthusiasm. Their equipment is simple, but effectual, and the reports which they send in during air exercises are of the utmost value to the H.Q. of the Fighter Command in locating raids and detailing fighters to intercept them. The headquarters of the Observer Corps are at Stanmore, beside those of the Fighter Command, and the organisation is now established over the country. There are four areas, Northern with its centre at Catterick, Midland at Grantham, Southern at Stanmore, and Western at Gloucester.

The anti-aircraft battalions and brigades are, as mentioned above, composed of Territorials. Thus the A.O.C.-in-C., Fighter Command, has under him men of the R.A.F., A.A.F., T.A., and the Observer Corps of special constables.

Reconnaissance

The Coastal Command is the third operational division of the R.A.F. It is at the moment on the verge of a major change, for it will soon have to hand over to the Admiralty all the squadrons and flights of the Fleet Air Arm which it has previously administered to some extent. As this change is due to take place in a short time, we will pass over these purely naval units and go on to consider the remaining functions of the Coastal Command. In brief, its task is reconnaissance over the waters round the coasts of the British Isles. It comprises two groups: No. 16 (Reconnaissance) Group and No. 17 (Training) Group.

The man in the street may wonder what a training group is doing in this command, when there is, as mentioned above, a separate Training Command. The reason for this is that flying-boat work is a thing by itself, and requires a special training which has little in common with the training of crews for landplanes. It is very much marine in character, and is concerned quite as much with the sea as it is with the air. Therefore the training of the flying-boat men has been left in the same command as the flying-boat squadrons. It is carried out at Calshot station. Hitherto No. 17 (Training) Group has also administered the School of Naval Co-operation, which trained naval officers to become observers; but that school is sure to be handed over to the Admiralty, and therefore need not concern us.

No. 16 (Reconnaissance) Group comprises thirteen squadrons, divided into three classes. There are two torpedo-bomber squadrons both stationed at Thorney Island, off the Hampshire coast, five squadrons of flying-boats, and six squadrons equipped with Anson landplanes. Both the two latter classes are denominated "general reconnaissance squadrons." The work of the two, however, is not the same. The characteristics of the Anson are speed and suitability for flying over the sea without much likelihood of coming down in it. The flying-boats are less fast, but have a much longer range. Therefore, the work of the Ansons would be to patrol rapidly over the sea not too far from land, searching for hostile submarines or surface craft, while the flying-boats could undertake long reconnaissance. In recent exercises some flying-boats spotted the hostile fleet in the Bay of Biscay and kept in touch with it until it came within range of squadrons which were able to attack it in strength.

The torpedo bombers are almost purely a striking force.

No. 16 (Reconnaissance) Group also administers the Marine Aircraft Experimental Establishment at Felixstowe.

Training

The Training Command is the fourth division of the R.A.F. at home. It is, of course, of tremendous importance, for without it the supply of pilots and aircraftmen would speedily dry up. But, of course, it is not an operational command. That is to say that its aircraft and the instructors on its staff could not be used for fighting in time of war. In fact, if war were to break out, the work of this command would at once be immensely increased, for casualties would occur and they would have to be replaced, while the normal output of pilots would have to be maintained, and might even have to be increased.

The activities of this command may be analysed as follows:— (a) The training of officers for permanent commissions; (b) the training of short-service officers and airmen pilots; (c) the training of aircraft apprentices; (d) the training of direct-entry airmen and boy entrants; (e) the issue of equipment to units; (f) recruiting.

These activities are divided between five groups, namely, No. 23 (Training) Group, No. 24 (Training) Group, No. 25 (Armament) Group, No. 26 (Training) Group, and Cranwell. The last-named is not entitled Cranwell Group, but it ranks as a group. To this command are also assigned all sorts of miscellaneous units, such as the Record Office at Ruislip, the R.A.F. Central Band, the Royal Airship Works at Cardington, and the School of Cookery.

It would not be of general interest to describe in detail all the work of the groups in this command, but an out-

line of their division of duties may be found of interest.

No. 23 (T) Group administers the Central Flying School, the ten Flying Training Schools in this country, the School of Air Navigation and some miscellaneous units. It possesses one squadron, No. 48 (General Reconnaissance) Squadron, which provides aircraft for the use of the School of Air Navigation at Manston.

No. 24 (T) Group is the most heterogeneous section of the whole R.A.F. Its most important responsibilities are: the Experimental Section of the Royal Aircraft Establishment at Farnborough, No. 1. School of Technical Training (Apprentices) at Halton, the Home Aircraft Depot at Henlow, No. 3 School of Technical Training (Men) at Manston, the Aeroplane and Armament Experimental Establishment at Martlesham, No. 1 R.A.F. Depot at Uxbridge, the recruiting organisation, and most of the Maintenance Units which serve out equipment. Several of these activities are not concerned with training, but it is more convenient to put them into the Training Command than to burden any other command with them.

Armament

No. 25 (Armament) Group has a very important function, for unless the R.A.F. can bomb and shoot with accuracy there is no point in flying at all. So this group administers the Air Armament School at Eastchurch and eight Armament Training Stations round the coast, where squadrons go to drop live bombs on targets and to fire at drogues towed through the air and targets on the sands. This group also administers the Air Observers' School at North Coates.

No. 26 (T) Group has charge of the twenty-three Elementary and Reserve Flying Training Schools which are run by civilian companies for the elementary (formerly *ab initio*) training of short-service officers and airmen pilots before they go on to the R.A.F. Flying Training Schools of No. 23 (T) Group. These civilian schools also put officers on the Reserve of Air Force Officers through their annual flying courses. This group is also in charge of the Town Centres of the R.A.F. Volunteer Reserve.

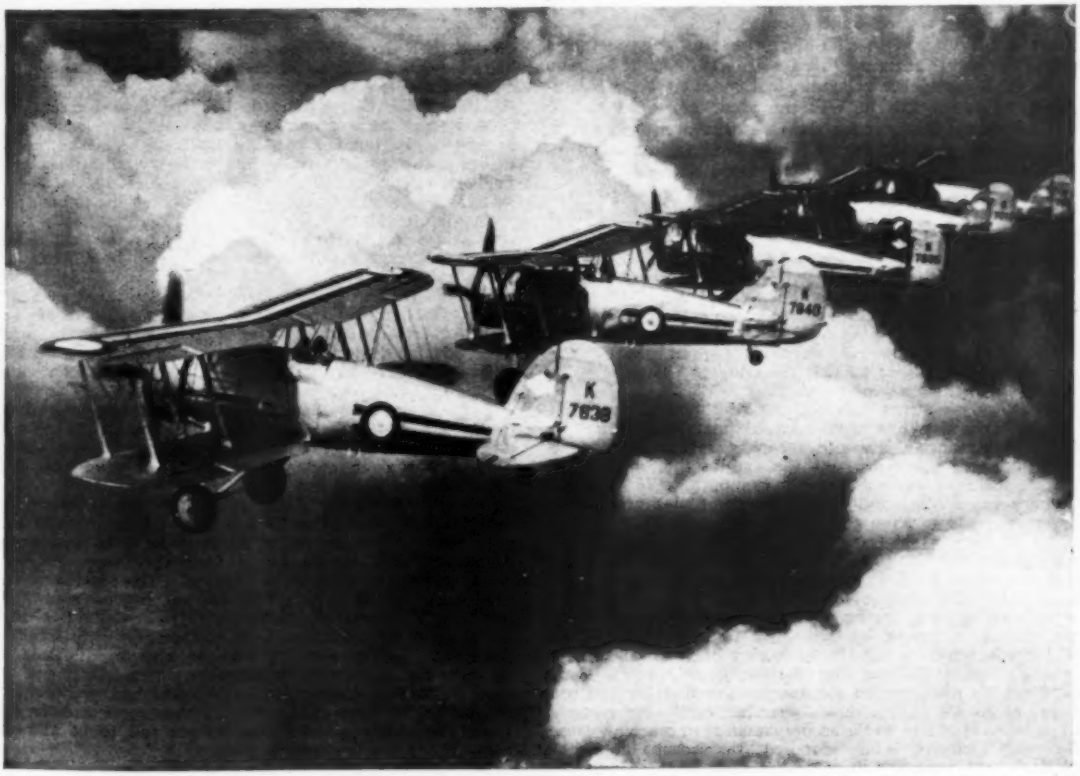
Queries are sometimes heard as to the difference between the Reserve of Air Force Officers and the R.A.F. Volunteer Reserve. The answer is quite simple. The R.A.F.O. consists of short-service officers who have completed their time on the active list and are doing four years on the Reserve. During these four years they retain their commissions and are liable to be called up if an emergency should occur. The R.A.F. Volunteer Reserve is for civilians who wish to prepare themselves for an emergency. On joining the Volunteer Reserve they are taught to fly at Government expense and are given the rank of sergeant pilot. They, too, are liable to be called up in an emergency.

At Cranwell are situated the R.A.F. College and the Electrical and Wireless School for Aircraft Apprentices. The College is for Flight Cadets, who for two years are trained there for permanent commissions. It is, in fact, the main source from which permanent officers are drawn. The other usual source is the universities, but officers selected from the universities pass through the Flying Training Schools of No. 23 (T) Group.

The Electrical and Wireless School is a counterpart of the school at Halton, and trains apprentices as wireless operator mechanics and instrument makers.

Finally, a word may be said about the Air Ministry. At its head is the Secretary of State for Air, and immediately under him is the Under-Secretary of State for Air. Then come four Air Members of the Air Council, namely, the Chief of the Air Staff, the Air Member for Personnel, the Air Member for Research and Development, and the Air Member for Supply and Organisation. Finally, there is the Permanent Under-Secretary of State for Air, a civil servant who holds his post whatever Parliamentary party may be in power. These seven compose the Air Council. The last five all have various directorates under them, as explained in the diagram on p. 511.

Outside all the above organisation is the Inspector-General of the Royal Air Force, who keeps the Air Council in touch with the various commands both at home and overseas. The I.-G. may (and at the present moment



A close line-abreast by Gloster Gauntlet single-seater fighters. The Gauntlet has two guns, does 230 m.p.h., and is very manœuvrable.

does) hold a higher rank than is held by the Chief of the Air Staff, with whom he must work in close sympathy.

It is not proposed here to go fully into descriptions of the overseas commands of the R.A.F.; an article on Overseas work, in lighter vein, appears in this issue. It will suffice to add that there are six main commands and one subordinate one. These are: Middle East, with headquarters at Cairo, with a subordinate command in Palestine and Trans-Jordan; British Forces in Iraq, with H.Q. at Habbaniyah (recently called Dhibban); R.A.F. India, with H.Q. at New Delhi; R.A.F. Mediterranean, with H.Q. at Valetta, Malta; British Forces in Aden; and Far East, with H.Q. at Singapore. Where the title starts with "British Forces in," etc., it means that there are Army units in the command who are under the orders of the Air Officer Commanding.

The above is a brief outline of the organisation of the Royal Air Force. It discloses no secrets and only states facts which anyone may learn for themselves. But not everybody has the time or patience to ferret them out; and yet many, we believe, will be glad to have some comprehension of the subject. There are very few people now who do not take an interest in the air, and many are curious as to the way in which the R.A.F. can undertake the defence of the country. The above article has been written for their benefit.

The AIR LEAGUE DINES

The Air Cadet Scheme Launched

At the Air League Dinner the first London contingent of Air Cadets were inspected by the Duke of Sutherland, Sir Thomas Inskip, and Lord Trenchard.

IRRESPECTIVE of party or creed, more than 300 members of the Air League of the British Empire, gathered together at their annual dinner at Grosvenor House on Tuesday of last week, were unanimous in their desire to see Great Britain supreme in the air. Dukes, Lords and Commoners, Conservatives or Labour, they might differ in their views on ways and means but they were completely agreed on the end.

That Air Commodore Chamier, the League's energetic secretary-general, must be gifted with second sight to have chosen that particular psychological moment to get publicity for the Air League was the view expressed by Sir Thomas Inskip, Minister for the Co-ordination of Defence. And certainly it would have been difficult to imagine anything better calculated to focus attention on a body which has for its object air propaganda and the spreading of air-mindedness than the Ministerial crisis through which the Government had passed a few days previously. There is, however, no suspicion that the Air League engineered the fall of Lord Swinton!

The guests were received by the Duke and Duchess of Sutherland, and after the dinner His Grace explained for their benefit that the policy of the Air League of the British Empire is to support, irrespective of political opinions, the Government of the day so long as that Government is seriously and honestly doing its best for aviation.

THE DUKE OF SUTHERLAND expressed the view that in a democratic country like ours we could not be expected to equal the totalitarian states in the way we handled production and labour problems. At the end of the last war we were producing 2,000 aeroplanes per month. We were not now on a war footing and could not expect such production. It was necessary to have patience.

After an interval of broadcasting by Mr. Tom Clark, who described the first Blackpool meeting, the Duke of Sutherland recalled that the Air League was founded the same year, 1909. It had done good work in spreading air propaganda, and this would be extended in the near future when they came to make their appeal in connection with the formation of the Air Cadet Corps, which would aim at having branches in all large townships. It was hoped that the membership of the Corps would quickly reach the 20,000 figure. The first London contingent of 20 Air Cadets then "marched on" very smartly, and stood to attention to the accompaniment of much applause.

LORD STRABOLGI, who proposed the toast of British Aviation, paid a warm tribute to the work of the Air League and its secretary-general, Air Comdre. Chamier. Referring to the recent resignation of Lord Swinton, he recalled that they had sat in Parliament together for many years, first in the Commons, when Lord Swinton was Sir Philip Cunliffe Lister and he was Commander Kenworthy, and afterwards in the Lords. Lord Swinton had spent himself unstintingly in his work, and when the history of the present time came to be told, it would be found that we owed a great deal to him.

There were two reasons for the present agitation in connection with the expansion: The R.A.F. had become our first line of defence. He could say that without disloyalty to his old service, the Navy, because in the first assault it would be the Air Force that mattered, but the final decision would depend upon keeping our sea routes open, i.e., on the Navy. Secondly, we were expanding on a peace basis, without embarrassing general trade and industry, and keeping our financial strength. He welcomed the Air Cadet scheme and said there would be no opposition to it from the Labour Party.

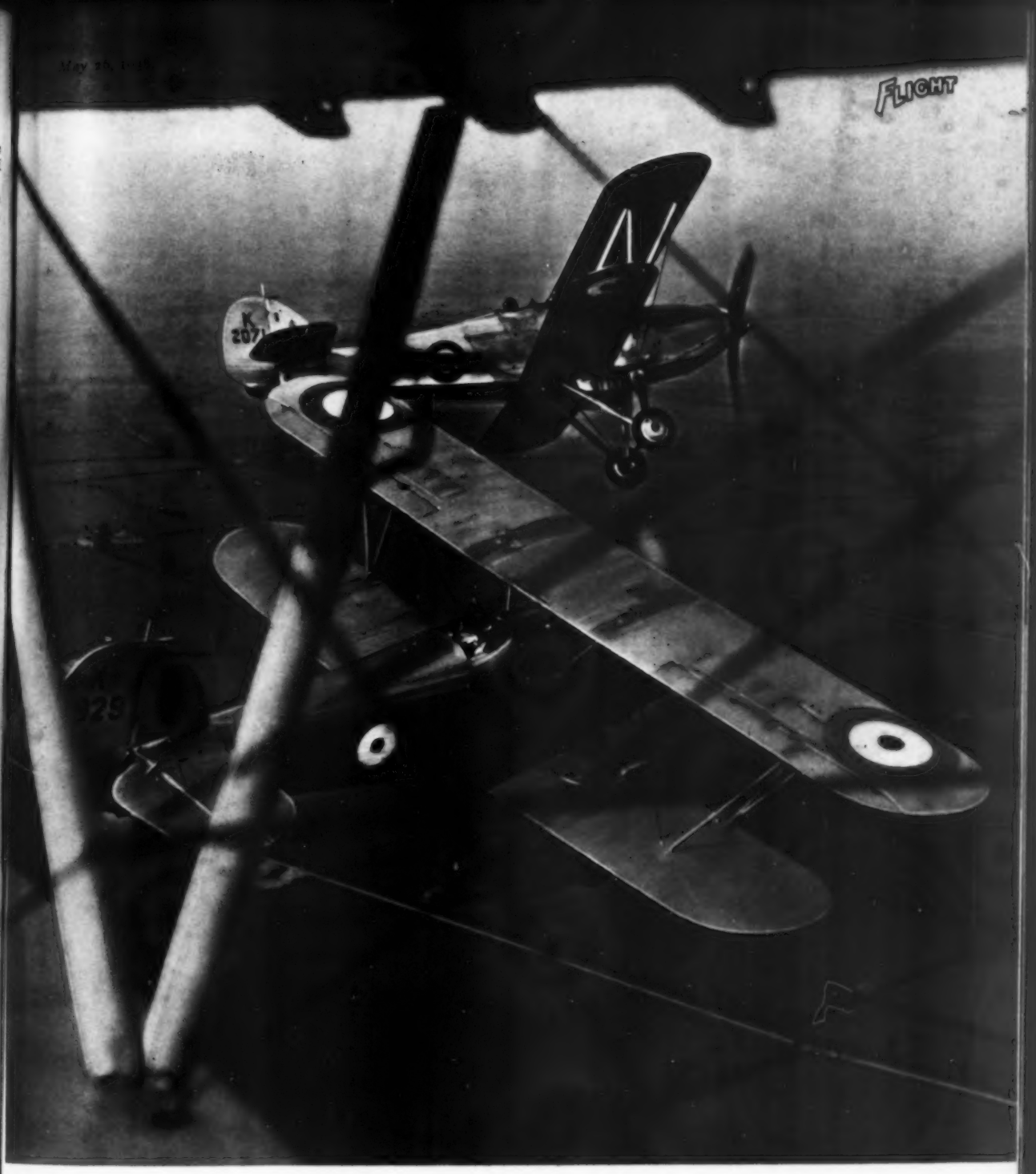
SIR THOMAS INSKIP, responding to Lord Strabolgi's toast, also paid a tribute to the work Lord Swinton had done for the R.A.F. and to the great services of Lord Weir. He thought Sir Kingsley Wood, the new Air Minister, would receive the support and confidence of them all, and pointed out that production was largely a matter of £.s.d. Their duty was to see that this country became supremely strong in the air. The industry had done well under difficult conditions, and building aeroplanes demanded a degree of precision not required in other branches of engineering.

REAR-ADMIRAL SIR MURRAY SUETER, in proposing the toast of the guests, recalled that when he was at the Admiralty during the war he gave Mr. Handley Page his first order for a large aeroplane and was called the biggest fool in the Admiralty for doing so.

MR. F. HANDLEY PAGE said that the British aircraft industry only wanted to be left alone; then it could get on with production. But it could not do so if its members were constantly told what a lot of fools they were. There was a lot of talk about mass production. The expression meant production for the masses, and was not applicable to aircraft.

Mr. A. V. ALEXANDER took the Duke of Sutherland to task for his reference to labour in this, compared with totalitarian countries. British workers were as able to do their share as were the workers in totalitarian states. During the last war millions of workers were in khaki and production was largely helped by women. To-day there were millions out of work; they only asked to be trained and to be allowed to help. They would do their share.

During the evening the Duke of Sutherland read telegrams from pilots and crews of Imperial Airways machines flying over various parts of the Empire.



THE SKILL of the SERVICE

A PAIR of Hawker Fury single-seater fighters of the Advanced Training Squadron, No. 3 Flying Training School, South Cerney, skating along on their sides in a "crazy formation" rehearsal for Empire Air Day. This, like the large majority of the pictures illustrating the article "With the Squadrons" in the following pages, was secured by "Flight" during a "pre-view" tour of a number of stations preparing Empire Air Day displays, and typifies the high standard of flying that will be seen on Saturday.

VARIETY at GOSPORT

A pupil attached to the Torpedo Training Squadron, Gosport, releases the massive projectile from his Swordfish.

A unique formation of eight Service types which are normally to be found at Gosport. They are, reading from the top of the picture, Vildebeest, Osprey, Shark, Tutor, Avro 504N, Swordfish, Nimrod and Magister. Further explanation is given in the accompanying article.

WITH THE SQUADRONS

Hawker Hurricane eight-gun fighters of No. 111 (F.) Squadron.

—and Other Units of the Royal Air Force : A Tour of Representative Establishments and a Preview of Empire Air Day Events from the Performers' Angle : Modern British Military Types and Their Employment

By H. F. KING

Illustrated Mainly with "Flight" Photographs

NEXT Saturday, if our irresponsible Weather Clerk is in a public-spirited mood, is to be a great national field-day. The Royal Air Force will be at home to its "owners."

It has been planned, through the interchange of aircraft, to make the Empire Air Day display at each of nearly sixty Service aerodromes as representative as possible of the work of the R.A.F. But excellent as the shows will be they can at best provide but a glimpse of the everyday activities of a great service.

FLIGHT, in the following pages, presents an introductory account of R.A.F. work and equipment based on material gathered on a number of recent visits to typical units. The writer has attempted to recall some of his impressions in service aircraft during those visits—actual air experiences which must perforce be denied even the most ardent supporters of Empire Air Day.

THE FIGHTERS

IN the past, fighters (the war-time designation, "scout," has long since become archaic) have captured the popular imagination very largely by their speed, agility and climbing powers in comparison with other Service types. Light, strong biplanes with a substantial reserve of power, they lent themselves to incredible feats of aerial virtuosity; their passing from the Service, which we are now witnessing, is causing a great deal of unwonted sentiment to be displayed by fighter pilots, for neither the modern fighter monoplane nor its pilot is designed to withstand violent manœuvring at the awesome speeds now available. But, touching as are their lamentations, these pilots are secretly longing to plant their feet on the rudder bar of a Hurricane and to feel on the stick the control for the eight Browning guns. Some squadrons are down to receive the even faster Spitfire; others are likely before long to be flying a replacement type for the Demon—our present standard two-seater fighter.

Having regard to the somewhat disturbing metamorphosis which fighters have lately been undergoing, some clarification of what is now demanded of them may be of use.

For the purposes of this article we must consider separately the single-seaters and the two-seaters.

The former, as typified by the Hurricane and Spitfire, are low-wing monoplanes with retractable undercarriage, flaps and enclosed cockpits, but not variable-pitch airscrews, for the take-off acceleration is deemed quite satisfactory without. In each case, the engine is the Rolls-Royce Merlin II twelve-cylinder liquid-cooled vee of 1,050 maximum h.p. delivered at 16,000 ft.

Eight of the new Browning machine guns (of American design but manufactured in this country) are fixed in the wing of the Hurricane; each is estimated to be capable of firing at speeds approaching 1,500 rounds a minute. The armament of the Spitfire is still secret, but it would be reasonable to assume that it is similar to that of the Hurri

Pilots of No. 111 (F.) Squadron ensconced in their "bunk house" near the tarmac, where their Hurricanes are available for immediate action. On the right is one of the pilots in Irvin suit and parachute, and wearing the combined oxygen and R/T. mask.

cane. Equipment of the Hurricane includes night-flying gear with landing-flare installation and two-way radio.

Three types of single-seater biplane fighters are still in use: the two-gun, two-bay Gloster Gauntlet (605 h.p. Mercury VI radial), its derivative type, the four-gun single-bay Gladiator (825 h.p. Mercury IX), and the Hawker Fury (derated Kestrel V). Top speeds respectively are 230 m.p.h., 255 m.p.h., and about 225 m.p.h.

The Hawker Demon two-seater fighter is undeniably obsolescent, though its equipment, which now in most cases includes one of the new Nash and Thompson power-driven gun turrets, is of a more advanced standard than the performance. No replacement type has yet been announced, but we may expect a monoplane capable of something like 300 m.p.h.

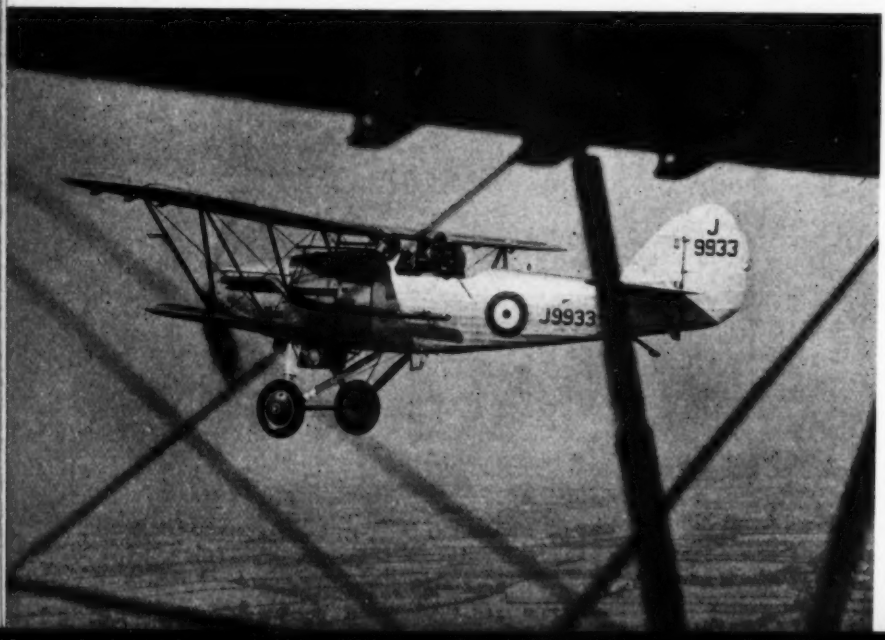
Single-seater fighters are stationed at strategic points for home defence, as explained in the article, elsewhere in this issue, dealing with the constitution of the Royal Air Force. Primarily, their functions are the interception and destruction of raiding bombers, but under certain circumstances they might be used for attacking ground targets. Eight guns would, by way of example, cut a wide lane through a body of troops.

Two-seater fighters score in that they continue to harass the target after the pilot has attacked with his front fixed guns. They have a favourite trick of flying slightly ahead and below a formation and firing up with their rear armament. This form of attack would be particularly effective against machines which, like the Blenheim bomber, have neither turret in the nose nor guns beneath the fuselage.

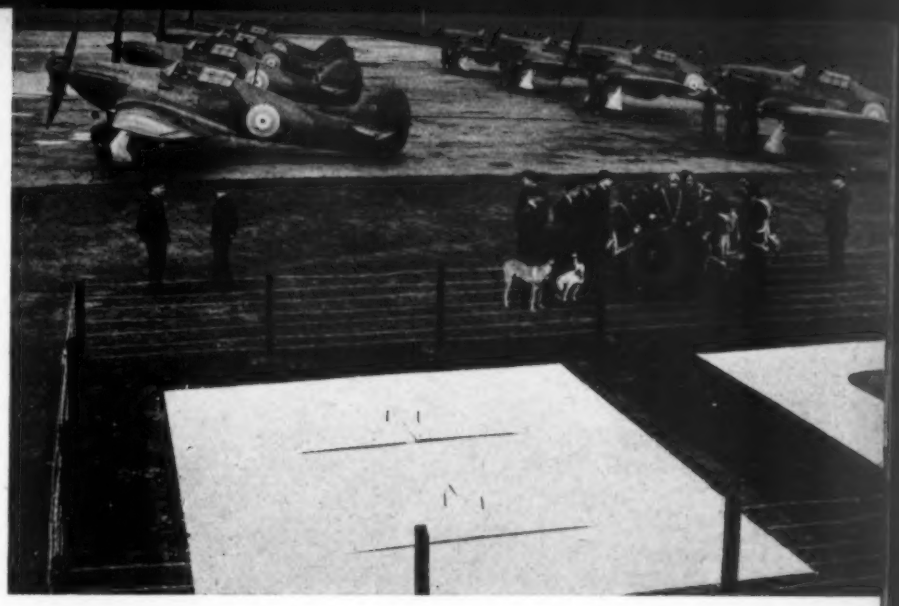
Fighter pilots must be skilled in night flying, and usually practise formation work rather more religiously than do other units. Temperament as well as ability is taken into consideration during selection. Within a few weeks of receiving their full complement of Hurricanes, No. 111 (Fighter) Squadron were flying in formation at night.

Not only is the fighter faster than other military aeroplanes, but it has a more rapid rate of climb and a higher ceiling, and fighter pilots are trained to make sustained flights at great heights. The oxygen necessary for these excursions into the upper air is supplied from cylinders *via* a mask, which also incorporates the R/T. (radio telephony). Every squadron has its individual call sign.

In modern fighters the cockpit is warmed. As the pilot is not required to move about while in the air he is supplied with an Irvin seat-



A Hawker Demon two-seater fighter, showing the installation of the Nash and Thompson power-driven gun turret.



Machines and personnel of No. 3 (F.) Squadron, the second unit to receive Hurricanes. The white objects in the foreground are used as signals to denote that QBI conditions are in force at Croydon.

pack parachute which, unlike the observer's type, or chest pack, issued to the crews of large machines, is permanently attached to its harness, and forms a cushion for the pilot in conjunction with a bucket-type seat.

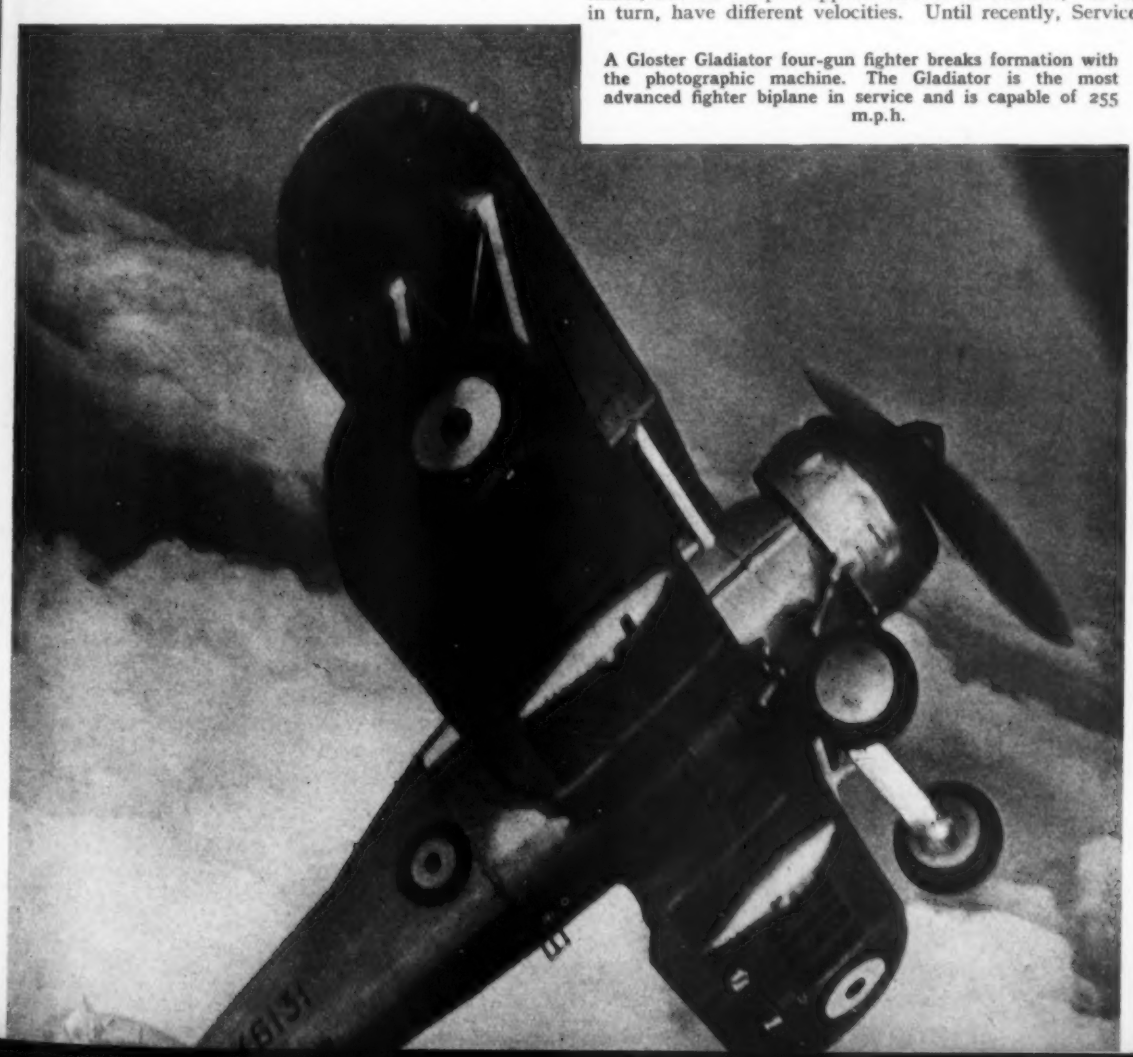
The real work of a fighter unit lies in practising the various forms of attack. Approaches to the target must be varied according to the number and disposition of the machines to be engaged and adapted to suit weather conditions. At the moment fighting tactics are undergoing a complete revision to suit the new Hurricanes and Spitfires.

The writer recently flew in a Fairey Battle bomber (representative of modern single-engine practice) of No. 142 (B.) Squadron when a flight of these machines was, theoretically, attacked by two flights of three Hurricanes each. Each flight came up directly astern and, having theoretically blazed away with their twenty-four Brownings, made a diving turn to starboard. There was no suggestion of aerobatics. It all seemed very grim and purposeful. One wished for a camera gun, and was sorry not to have seen the films from the two guns operating in the other Battles. But with forty-eight guns against three it was difficult not to regard it all as rather a waste of time. Glimpsing the tri-colour targets standing out from the "sand-and-spinach" camouflage as the Hurricanes turned away, one experienced a feeling of the kind to which so many people seem afraid to confess—a thrill of patriotic pride.

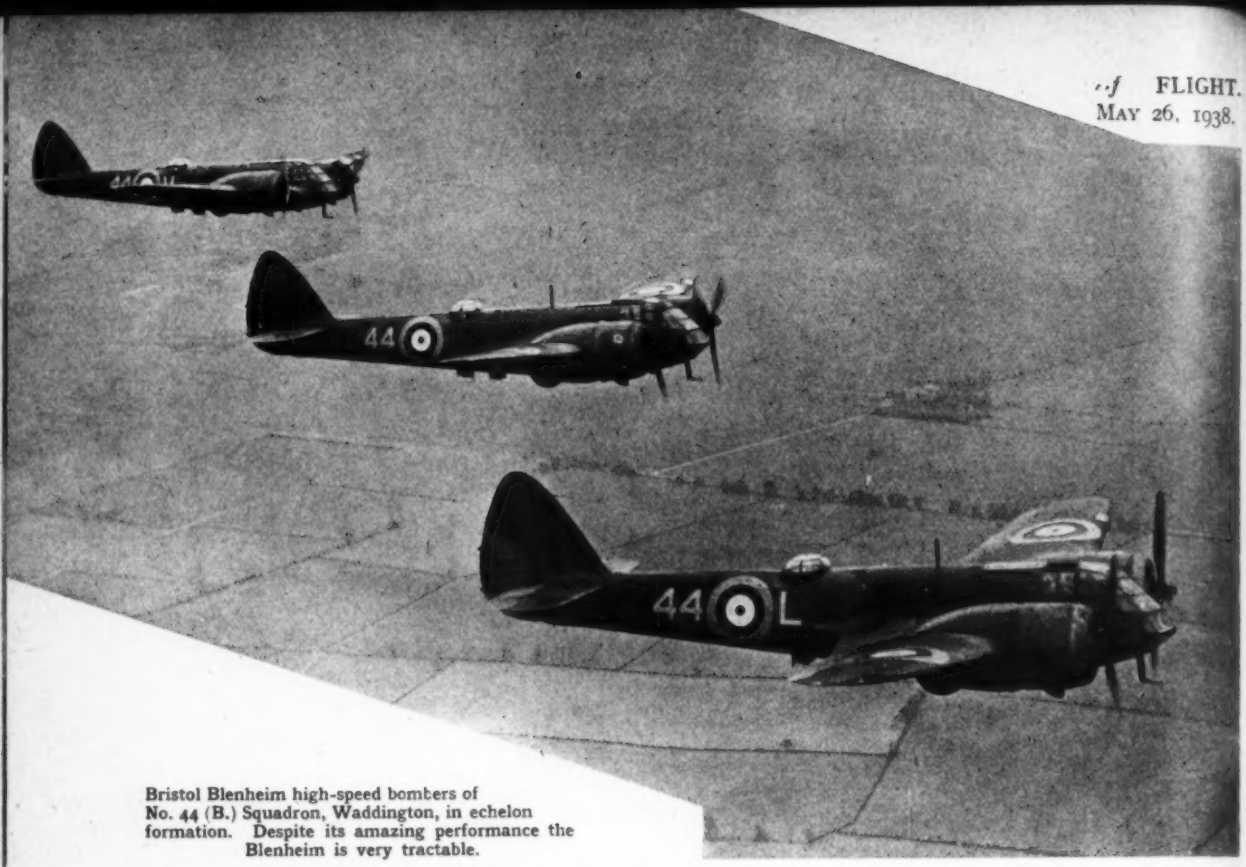
Every year each regular fighter squadron goes to one of the Armament Training Stations for practice with live ammunition, shooting both against drogue and ground targets, as described later in this article. The standard of accuracy attained by recently entered pilots is quite remarkably high.

THE BOMBERS

THE bomber has been likened to a long-range gun. On the whole, this is a very apt parallel. Not only can the pilot, like the gunlayer, select his target within narrow limits, but his weapon appears in various calibres, which, in turn, have different velocities. Until recently, Service



A Gloster Gladiator four-gun fighter breaks formation with the photographic machine. The Gladiator is the most advanced fighter biplane in service and is capable of 255 m.p.h.



Bristol Blenheim high-speed bombers of No. 44 (B.) Squadron, Waddington, in echelon formation. Despite its amazing performance the Blenheim is very tractable.

bomber types were classed in one of three groups: light, medium or heavy according to range and bomb load. But Expansion resulted in new "mediums" which were, in effect, "heavier" than the heavies built to the previous specification, and machines were projected which made current heavy bombers seem quite puny. So that system of nomenclature has been dropped.

Smallest of the bomber types in use is the Hawker Hind biplane, a development of the Hart, fitted with a fully supercharged Rolls-Royce Kestrel V compositely cooled engine and capable of carrying about 500 lb. of bombs on racks beneath the wing at speeds ranging up to approximately 185 m.p.h. Equipment includes night-flying gear, and two-way radio, and armament comprises a fixed Vickers gun for the pilot, with a Lewis over the rear cockpit for the use of the air gunner/bomb-aimer.

No. 50 (Bomber) Squadron at Waddington was chosen as a representative Hind unit by *Flight's* itinerant representatives. The C.O., Sqn. Ldr. R. B. Sutherland, D.F.C., explained that his Squadron's Empire Air Day offering would include the front-gunning of a towed drogue target (the Hind is extremely manœuvrable and is, in fact, very closely related to the Demon two-seater fighter) and dive-bombing. This latter form of attack is popular for use against small targets, and, as visitors to the last R.A.F. Display may recall, offers extreme accuracy.

Dive-bombing approaches are varied to suit conditions, but it is usual for the machines to "peel off" from an echelon formation at, say, 10,000ft. and to dive for the target at an angle of about 60 degrees. The bombs are released at about 3,000 ft., when the speed may be over 300 m.p.h., and the pull-out started immediately.

"Precision," or high-altitude, bombing is also practised, the pilot flying straight and level while the bombs are sighted by the bomb-aimer, who has a prone position on the floor of the fuselage.

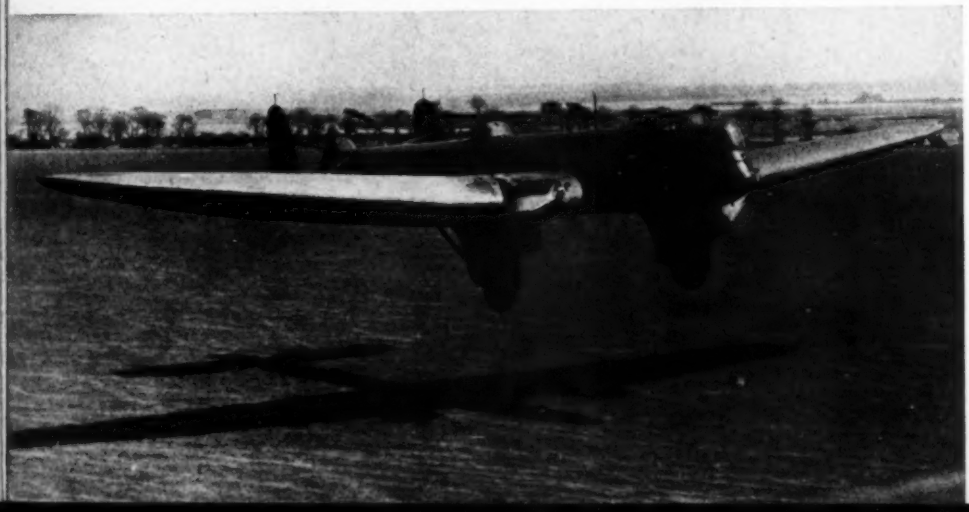
Hind squadrons are also trained to make low-flying attacks with machine guns and small bombs. The latter, in this case, are not sighted but are released solely on the judgment of the pilot.

Hinds lend themselves very well to formation work, the leader giving orders either by R/T. or visually through the medium of his air-gunner, who signals with his arms.

Wearing one of the new combined R/T. and oxygen masks and flying in the leading Hind of the formation depicted on page *h* of this supplement, one was able to listen to the pilot giving his orders. The system used is not without interest.

Every squadron equipped with R/T. is, as already explained, allotted a call-sign which, by way of example, we may take to be "Thrush." Each machine has its wheels and spinner painted red, yellow or blue according to whether it belongs to "A," "B" or "C" flight. For R/T. purposes the flight colour and formation number are quoted; thus "Thrush red, one" means "Leader of 'A' flight." A typical order to the entire squadron when flying in formation might be:—

"Hullo Thrush, Thrush leader calling. Flights echelon starboard, Flights echelon starboard, GO."



A Fairey Hendon bomber belonging to No. 38 (B.) Squadron takes off from Marham for an Empire Air Day rehearsal

Hendons of No. 38 Squadron. The depth of the wing and the unusual cockpit arrangements are worth noting.

"Go" is always the executive word.

At Waddington we dropped in on No. 503 (County of Lincoln) (Bomber) Squadron, Auxiliary Air Force, which uses Harts and is about to be re-equipped with Hinds; these will become available as a Regular squadron receives a later type. A recent acquisition is one of the new Hind Trainers, which have duplicated controls and instruments. On Empire Air Day at Waddington an Auxiliary Hart will do individual aerobatics, and the squadron will co-operate with local "Terriers" in a set-piece.

In all there are four squadrons at Waddington, the two not already mentioned (Nos. 44 and 110) being equipped with the Bristol Blenheim, the fastest bomber in service anywhere in the world. No. 110 was away on a job of work while we were at Waddington, but No. 44 showed us something of the capabilities of the Blenheim. The performance table for this twin-engined bomber, which has a range of 1,000 miles shows a top speed of 279 m.p.h. at 15,000ft. (though it is probably considerably higher), a climb to 20,000ft. in 13 min., a service ceiling of 30,000ft., and a take-off run of 330 yards. The engines are two Bristol Mercury VIIIs driving De Havilland variable-pitch three-bladed airscrews 10ft. 6in. in diameter. Each of these nine-cylinder radials delivers a maximum power of 840 h.p. at 14,000ft., and is enclosed in a long-chord cowling incorporating an exhaust collector ring in the nose and cooling gills at the rear.

Flying alongside the pilot of a Blenheim, one was chiefly impressed by the astounding take-off acceleration, high rate of climb, and the response to the controls. Despite the proximity of the big, fully supercharged Mercuries, the noise is not nearly so intense as might be imagined. The cabin is quite roomy.

Like every other aeroplane the Blenheim has its disadvantages. For example, certain formations, such as line abreast, are impossible because of the restricted outlook sideways due to the large-diameter "power-eggs." On the other hand, vision forward and downward is all that could be desired.

Armament includes a fixed Browning gun for the pilot (this is mounted in the wing and is fired by compressed air by means of a button on the control wheel) and a second gun in a semi-retractable power-driven turret aft of the wing. Bombs are stowed internally on two "universal" carriers. Two small auxiliary racks for practice bombs are carried externally under the fuselage. The white excrescence which may sometimes be seen in the same region is stowage for a battery of Sashalites, which are "fired" to simulate the dropping of bombs over the camera obscura, by means of which accuracy may be gauged.

Large numbers of Fairey Battle and Vickers Wellesley single-engined bombers are being taken into service. The Battle, in which we flew with Nos. 12 and 142 (B.) Squadrons, commanded respectively by Sqn. Ldr. R. Reay-Jones and Sqn. Ldr. R. K. Hamblin, does 257 m.p.h. with a Merlin II. The "geodetic" Wellesley is slower, but has a longer range and heavier bomb load.

Three new high-speed twin-engined bombers, rather

On the left a Battle is seen coming in to Andover, where Nos. 12 and 142 Squadrons are armed with this formidable machine. Below, a Battle of No. 12 Squadron breaks from an echelon formation.

Handley Page Harrow bombers of No. 115 Squadron taxying in after a cross-country flight. The nose of a Battle gives a decorative touch.

heavier than the Blenheim, will shortly be put into service: the Handley Page Hampden (two Pegasus), Handley Page Hereford (two Dagger) and the Vickers Wellington (two Pegasus). These types will be more heavily armed than is the Blenheim.

At Marham we met—in the form of Handley Page Harrows and Fairey Hendons—larger, slower machines with longer range and greater bomb capacity, of the type previously known as heavy bombers. The Harrows belonged to No. 115 (Bomber) Squadron (Wing Cdr. F. L. Hopps, A.F.C.), and the Hendons are flown by No. 38 (Bomber) Squadron commanded by Wing. Cdr. E. S. Goodwin, A.F.C.

We found that the big Handley Pages had just come back from a long spell of night flying, and though we were not able to go into the air in a Harrow it was possible to inspect these huge monoplanes on the ground.

Spanning 88½ft., the Harrow is fitted with Handley Page slots and slotted flaps, which confer good landing and take-off qualities. It weighs 23,000 lb., and has a maximum range of 1,880 miles. With a pair of the new fully supercharged Pegasus XXs the top speed is 200 m.p.h.

An indication of the bomb load which can be accommodated is given by the extent of the bomb cells in the under portion of the fuselage, which stretch for the greater part of the length. Three gun turrets are provided, those in the extreme nose and tail being of the power-driven Nash and Thompson variety accommodating two Lewis guns each. These devices permit the gunner to "draw a bead" on a fast-moving target.

The Hendon (two Rolls-Royce Kestrel VI) is much older than the Harrow, but is of interest in that it was produced rather before its time. Though designed several years back, it displays several features utilised to advantage in more modern types, and is, moreover, very comfortable.

The interior, like the external lines, is most impressive. Entering through the tail-gun position one insinuates oneself along a cat-walk running the length of the fuselage, which, incidentally, is roomy enough to accommodate 15-20 troops. Inside the wing, which has a peculiar anti-stalling twist are the bomb racks.

Hawker Hinds of No. 50 (B.) Squadron, Waddington, climbing in formation. The leader is in communication with the other pilots by R/T.

One of the duties of an Army co-operation squadron is the transport of staff officers.

When a second pilot is carried he sits behind the first pilot—a somewhat unusual arrangement—the enclosure being offset to port to give a better outlook.

A much newer type—introduced at about the same time as the Harrow—is the Armstrong-Whitworth Whitley mid-wing monoplane, a revealing drawing of which appears in this issue. The latest version of this machine to be ordered for Service mounts two Rolls-Royce Merlins of over 1,000 h.p. each, and has a much improved performance. Although no figures are available it was obvious when flying in the prototype Merlin-Whitley at Martlesham that not only is the top speed very high but the manœuvrability and the landing and take-off qualities are excellent.

ARMY CO-OPERATION

IT would probably be easier to list the duties which an "army co-op" Squadron is *not* expected to perform than to enumerate its multifarious functions. Briefly, it makes reconnaissance flights to locate and photograph enemy positions and movements; it acquaints headquarters as rapidly as possible with its discoveries; it directs the fire of the artillery; it drops supplies by parachute; it provides transport for staff officers; it attacks obstacles in the path of the army with bombs and machine guns; and, when an opportunity presents itself or H.Q. demands, it makes itself generally unpleasant to enemy personnel.

Desiderata for an army co-operation aircraft are stability and ease of control (for the pilot himself does most of the co-operative work and, moreover, slow flying is often essential), a wide field of view for pilot and air-gunner; take-off and landing qualities which permit operation from small—often temporary—aerodromes; provision for defensive and offensive armament (though A.C. pilots are not encouraged to fly round challenging enemy aircraft); an airframe and engine which may be easily dismantled and maintained; and a performance at low and moderate heights as good as possible consistent with the requirements mentioned.

The pilots of No. 13 (A.C.) Squadron receive instructions relative to Empire Air Day from Sqn. Ldr. S. H. C. Gray. Their fine formation work is illustrated on our third photogravure page.

No. 13 (A.C.) Squadron at Odiham is commanded by Sqn. Ldr. S. H. C. Gray, whose acquaintance we made last year when his unit was first equipped with Napier Dagger-powered Hawker Hector biplanes. The Hector, with more than 800 h.p. in the nose, is good for nearly 190 m.p.h.

stuck in the ground) when the Army has no other means of communication. Very low, accurate flying is, of course, essential. A supply of small bags may be stowed in the Hector for dropping replies.

Future A.C. aircraft (the next type to see service will be the 229-m.p.h. slotted and flapped Lysander with Mercury engine) will be camouflaged like the new fighters and bombers, but the Hectors are finished in the beautiful silver dope which for so long has characterised R.A.F. aeroplanes.

and retains the unusually fine flying qualities of the basic Hart design from which, by way of the Audax, it was developed.

On the port side of the fuselage, firing along a channel in the cowling and with its breach in the pilots' cockpit, is a belt-fed Vickers machine-gun and over the rear cockpit, which is so designed that the wind-balanced gun-ring is well sheltered, is a drum-fed Lewis. Under each lower main plane is a bomb-rack which can be used without modification for the carriage of supply containers with their parachutes.

Attached to the axle of the undercarriage is a rod which terminates in a hook. This is used for collecting messages slung on a cord between two upright poles (or rifles with bayonets

(Above) A formation touch-down by Singapore IIIs of No. 209 (G.R.) Squadron.

In the circle is the Westland Lysander, the newest Army co-operation machine ordered for the R.A.F. Below is a view taken at Gosport in the torpedo shops.

Avro Anson general reconnaissance machines in an appropriate setting with a flotilla of destroyers below.

As we drive up to the impressive modern hangars at Odiham the Squadron Leader is convening an open-air meeting of his pilots to acquaint them with a few points relative to the Empire Air Day display during which, incidentally, No. 13 Squadron will combine with Nos. 4 and 53 (likewise A.C. units) in a wing fly-past. We arrange to fly in a dive-bombing attack on an aerodrome target. On Saturday this latter will take the form of a fortress which, after one flight of Hectors has, in Service jargon, "done a dive-bomb," will be subjected to a low-flying *strafe* with bombs and machine guns by a second flight.

Our pilot, who leads the dive-bombing flight, holds the rank of Flying Officer, and, like several of his fellow officers, has been seconded from the Army. Beneath the drab flying suit of the pilot who is to formate on our right is the splendid uniform of a Scottish regiment.

The armourers attach the little white practice bombs to their racks and the Daggers are started.

We lead our two fellow Hectors out in Indian file to a far corner of the aerodrome, whence we can avoid workmen laying down runways. By skilful use of their wheel-brakes the pilots position their Hectors to port and starboard for a formation take-off. Our pilot surveys the sky to ensure that no machines are coming in, and gives a quizzical "thumbs up" to each side, receives confirmation, raises his arm vertically and drops it to the throttle of the 24-cylinder Dagger.

We thunder over the parched grass past the blurred faces of the runway workers; the earth slides away; the red wheels spin, and the Hectors undulate in the mild bumps,

The upper right-hand picture shows Hawker Ospreys of No. 1 Coast Artillery Co-operation Unit in their unusual camouflage. Below it are a Supermarine Walrus and a Fairey Sea Fox glimpsed from one of the Felixstowe hangars.

The Rolls-Royce-Merlin-powered Armstrong Whitworth Whitley IV on test near the Aeroplane and Armament Experimental Establishment, Martlesham Heath.

but the air-gunner on our left, with his elbows on the gun-ring, is the personification of nonchalance. Standing, we find the air blast from the massive wooden airscrew is very trying, so we pull down the folding seat and sit facing astern. We note the marked off-setting of the Hector's fin (to counteract torque), the radio aerial overhead, and read "Barr and Stroud" on the wind-balanced gun-ring round the cockpit. We are surrounded by switches, R/T. gear and pegs for the ammunition drums. The chest-pack parachute, detached from the big stainless steel hooks on our harness to give us freedom of movement, is stowed in its rack on the forward wall of the cockpit. The black butt of a Very pistol protrudes conveniently from its canvas holster. As the Hectors change to a wide echelon formation we reaffirm that the "dog chain," or safety wire which connects with our parachute harness and anchors us to the floor, is securely attached. Our height, we judge, is 3,000 odd feet.

Then the horizon tilts crazily. The other Hectors seem to be drawn up and away from us by some ethereal vacuum cleaner. The rigging wires voice impassioned revolt and sleepy, maternal Hampshire approaches forbiddingly as though disturbed by the unseemly din of these tiresome aeroplanes standing on their noses and screaming.

Factually, we are approaching the target in a 65-deg. dive and the needle of the air speed indicator on the pilot's dashboard has gone "off the clock" at 200-odd m.p.h. The target passes beneath the nose cowl of the Dagger and the pilot shifts his bomb release lever on its quadrant.

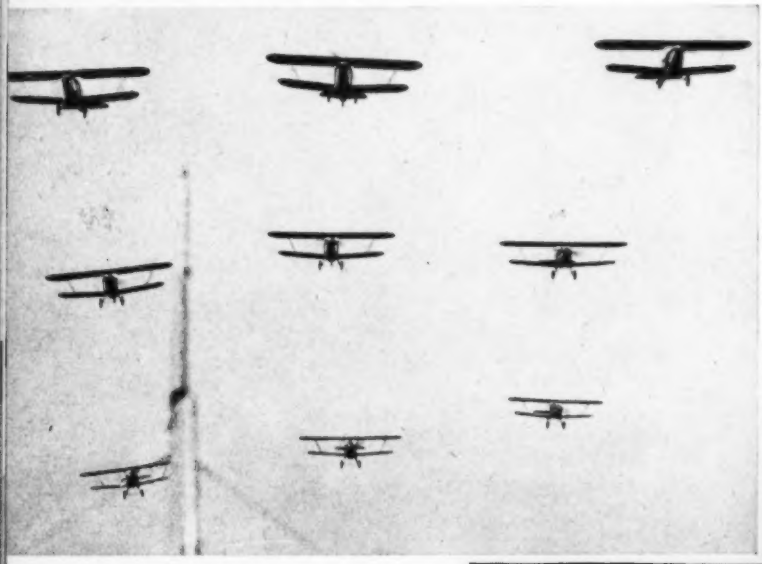
As the earth begins to rush up and the horizon on our left swings back to horizontal and reverses its angle that vacuum cleaner tries to draw us down through our seat and out through the floor. Though we have dodged Mother Earth, Old Man "g" has taken a hand in the proceedings.

The aerodrome drops away under our tail and we glimpse the drifting white smoke puffs from our bombs augmented as the other Hectors start unloading their racks. The score looks most satisfactory. Our zoom develops into a gentler climb as we continue to gain height for our second dive.

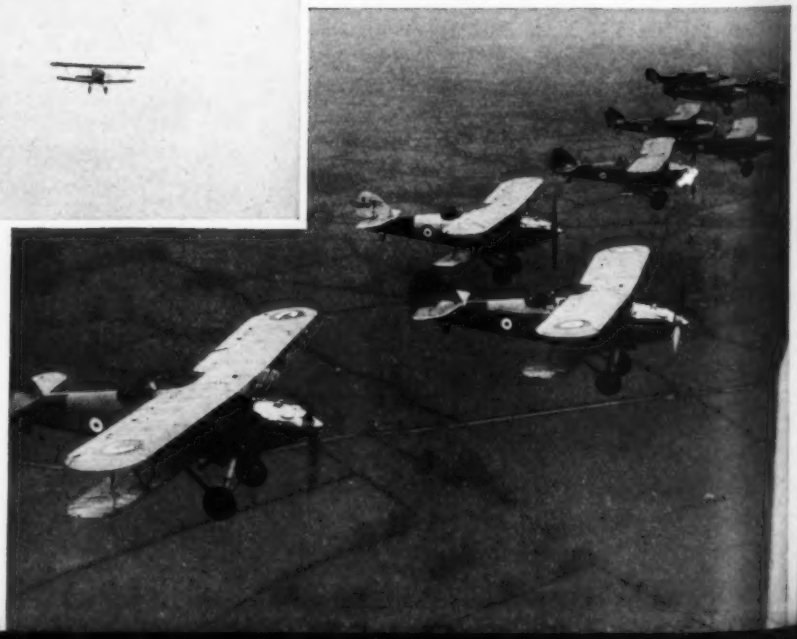
And so the time passes with sustained attacks until there are no more white blobs on the Hector's bomb racks. Our wings rock violently from side to side as numbers 2 and 3 Hectors come skating across the sky towards us and tuck themselves back into formation for the landing.

COASTAL and FLEET AIR ARM

IN view of the ever-growing importance of the Fleet Air Arm the above title may appear to slight that tremendously energetic, if, at the moment, somewhat small, contribution to defence. The explanation is that it was not possible, in our "preview" visits, to see the F.A.A. working from an aircraft carrier or from the decks of warships, as it normally does, and accordingly a visit was paid to Gosport, which is very closely associated not only with Fleet



Hart Trainers, flown by instructors of No. 3 F.T.S., South Cerney, in an effective Empire Air Day formation.



The same machines demonstrate "flights line abreast." Folded blind-flying hoods may be discerned on the nearest aircraft.

Air Arm activities but with coastal defence.

Gosport R.A.F. station is under the command of Group Capt. B. E. Baker, D.S.O., M.C., A.F.C., and embraces a Station Flight, a Training Squadron and No. 1 Coast Artillery Co-operation Unit, the latter under the command of Sqn. Ldr. E. A. Hodgson. Accommodation is provided for Fleet Air Arm units when disembarked.

The Station Flight is a much larger unit than is normally suggested by the term and, in fact, runs a pool of F.A.A.

FOUR INTIMATE GLIMPSES of the more domestic side of life in the Royal Air Force.

(Above) The kitchen at one of our new R.A.F. stations.

(Left) An ever-popular relaxation available to the airman of to-day.

(Above and left) Comfort—asleep or awake; the airman with his convertible chair-cum-bed.

pilots. Commanded by Flt. Lt. J. Constable-Roberts it gives conversion courses (familiarising a pilot with a new type) and puts prospective carrier pilots through landing-on practice with the aid of a "deck" marked out on the aerodrome

Some idea of the variety of aircraft types available to the flight is given by the picture of the formation in our photogravure section. This was quite a masterpiece of organisation on the part of Flt. Lt. Constable-Roberts and his pilots (not forgetting the Vildebeest borrowed from the Torpedo Development Flight which lives just across the tarmac), and one jumped at the chance of going up in a Shark with the Flight Lieutenant and to watch these strangely assorted machines resolve themselves into a perfect formation. The venerable Avro 504N was given pride of place. It was quite a thrill to sit five or six thousand feet above the grey Solent watching fleet fighters, torpedo machines and trainers sidling up to the ancient Avro from all corners of the sky and to arrange themselves as the two arms of a "Vic."

Of course, the Nimrod and Osprey pilot *did* have a few words to say at the ensuing foregathering in the Flight Lieutenant's office. While the Avro's Lynx was turning merrily at full bore, the Kestrels were throttled well back and control was not of the lightest. The Shark, Swordfish

A camera installation in an old Hawker fuselage is used for instruction at the School of Photography, Farnborough.

and Vildebeest torpedo machines, with their ample wing area, were rather happier.

To make the "Heinz" formation all the more unique, pilots were drawn from the R.A.F., Army, Navy and Marines. Six aircraft manufacturers (Avro, Hawker, Fairey, Blackburn, Vickers and Phillips and Powis) were represented, and the engines were Bristol, Pegasus II and III, Rolls-Royce, Kestrel II MS and V, Armstrong Siddeley Lynx IVC and Tiger VI, and De Havilland Gipsy Major.

The Training Squadron is divided into two, the divisions being the Coastal Defence Development Flight and the Torpedo Training Unit. The work of the former is chiefly of a hush-hush nature. The Torpedo Training Unit is commanded by Sqn. Ldr. J. G. Elton, A.F.C., and is equipped with Fairey Swordfish torpedo-spotter-reconnaisance two-three-seater biplanes with Pegasus IIIM engine. It trains not only all F.A.A. torpedo pilots, but those destined for shore-based squadrons, in their highly specialised work. The Swordfish, together with the Tiger-engined Blackburn Shark, forms the torpedo-dropping equipment of the Fleet Air Arm and is provided with flotation gear and deck-arrester equipment.

Three courses a year are held, each lasting three months, and instruction must be given not only in the actual aiming and release of the "tin fish," but in the technique of approaching the target as governed by weather conditions. Pupils must be taught to realise when they are open to the fire of the high-angle armament on the target and at what range multiple pom-poms and large-calibre machine-guns become effective. A really startling number of torpedoes is dropped daily. It is absorbing work and . . . but come in the rear cockpit of a Swordfish on a practice flight.

The preliminaries to an over-water flight are somewhat more extensive than usual. Apart from the completion of the usual "blood chits," the donning of a Sidcot, helmet, goggles, parachute harness and gloves, one has to wriggle into a waistcoat-like life-jacket popularly known by the name of a film star. This has a topping-up tube and inflation is effected from the lungs. Thus equipped, we scale the side of the Swordfish and drop into the rear cockpit, which is big enough for a navigator and air-gunner to discharge their obligations unhampered.

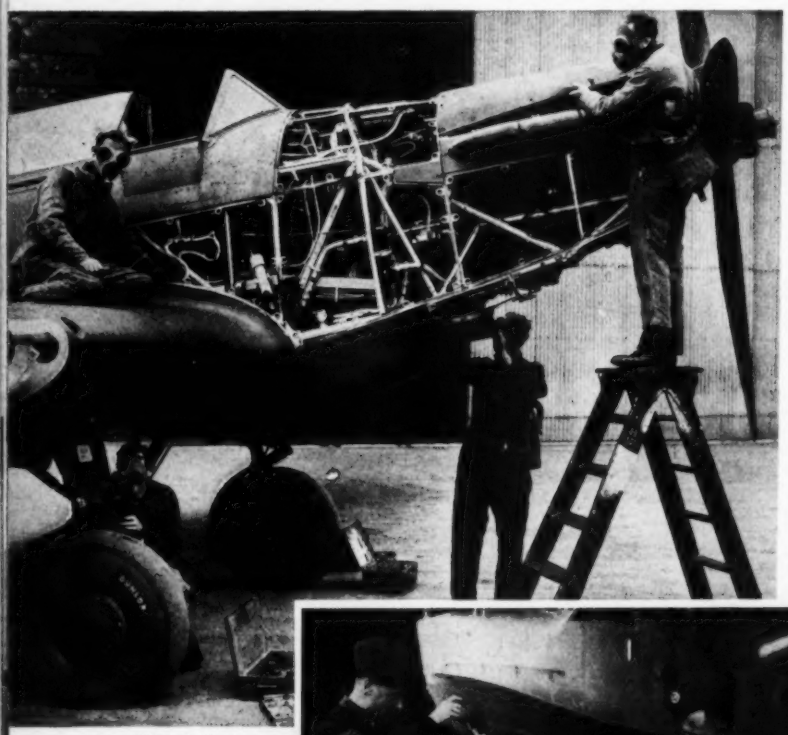
The take-off, complete with massive "fish," is something to marvel at; there is no suggestion of staggering into the air as with some of the early types. We are six, the leading ones in each flight of three bearing instructors who will note the shortcomings of their charges. Their machines do not carry a torpedo.

Some miles out to sea is the cruiser *Dunedin*. Her job in life is to steam back and forth offering herself as a target. She also helps pick up the dummy torpedoes, which are, incidentally, set to run beneath her. Even so, their wake is ample to permit accuracy to be assessed.

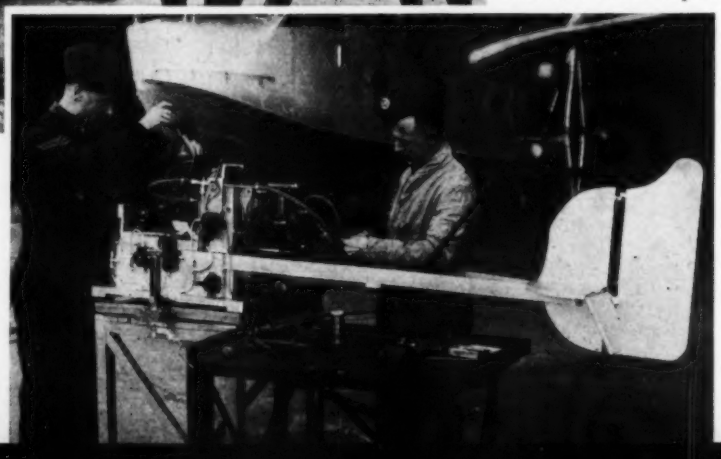
As the present batch of pupils are new to the work and have not yet practised the advanced forms of attack we are out for aiming practice, *i.e.*, a straightforward dive, level off, aim and release.

The obliging *Dunedin* sighted, we whistle down one by one towards the inhospitable white-flecked water.

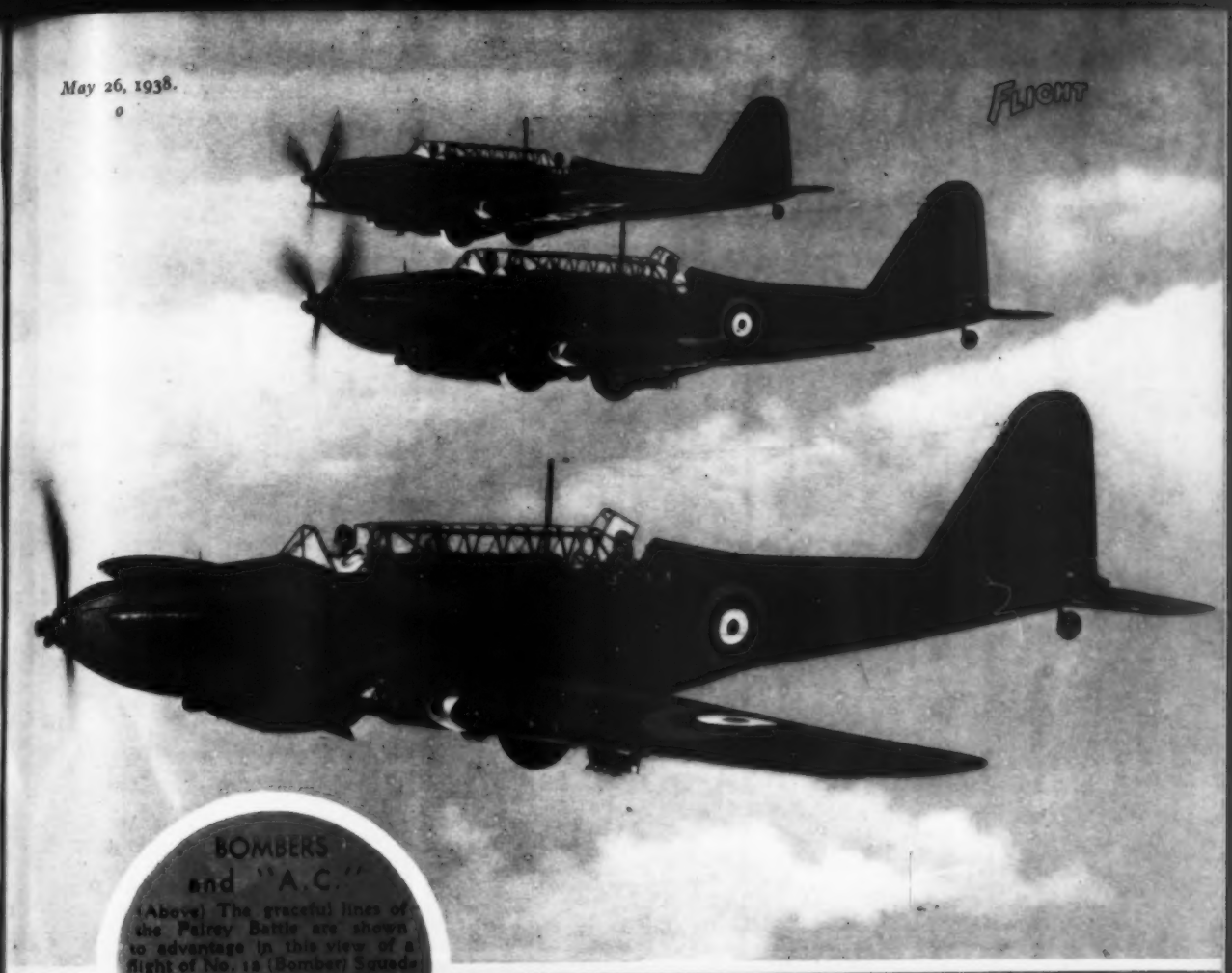
As we level off, the waves stream past in alarming proximity. Precise judgment of height over the water requires a good deal of experi-



(Above) During certain periods ground personnel are expected to work in their gas masks to accustom them to the "feel."

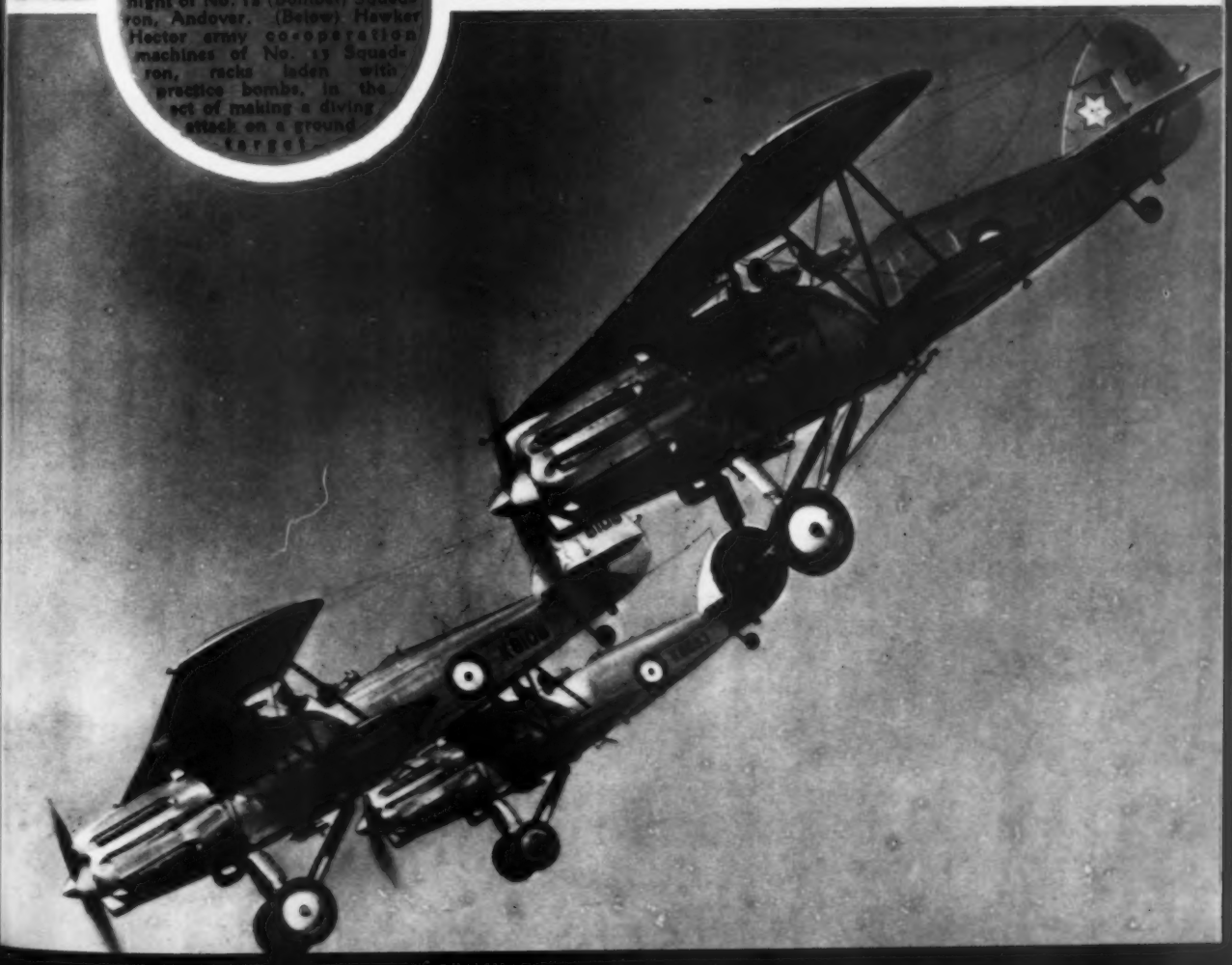


(Left) "George," otherwise an automatic pilot with demonstration model control surfaces, being groomed for Felixstowe's Empire Air Day show.



BOMBERS and "A.C."

(Above) The graceful lines of the Fairey Battle are shown to advantage in this view of a flight of No. 12 (Bomber) Squadron, Andover. (Below) Hawker Hector army co-operation machines of No. 13 Squadron, racks laden with practice bombs, in the act of making a diving attack on a ground target.

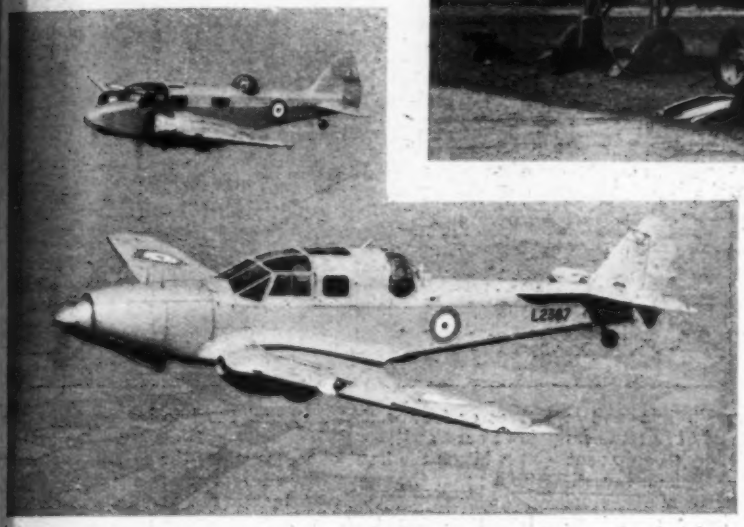


FELIXSTOWE CONTRASTS

Short Singapore IIIs of No. 209 (General Reconnaissance) Squadron, Felixstowe, as seen through the window of the top machine in an echelon formation. (Below) *Mercury*, upper component of the Short Mayo Composite, being lowered on to *Maia* prior to a full-load separation.

(Right)
The Blackburn Skua dive bomber fleet fighter just before diving tests at Martlesham Heath.

(Below)
Two modern trainers; The De Havilland Don with a single D.H. Gipsyking engine and the twin-engined Airspeed Oxford. Both machines are being flown by Martlesham test pilots.



ence. *Dunedin* crosses the torpedo sights about a mile ahead, and as her hull grows larger we lift into a climbing turn. Facing aft we see our "fish" burrowing under the waves, and, despite the depth at which it is running, can follow its track right up to the ship.

One by one the big biplanes sweep just above the white horses and drop their torpedoes with varying success. A special camera on each records accuracy. We circle the *Dunedin* and rejoin formation, except for two of our number, who stay behind to point out the "fish" to the salvage crews.

Back at the aerodrome we kept an appointment with No. 1 Coast Artillery Co-operation Unit, which, equipped with curiously camouflaged Hawker Osprey two-seaters, works with Territorial units when they man the coastal defences during their annual training period. For the time being, the unit is the only one of its kind, and its duties take it to all parts of the coast. Not only is the fall of shot wirelessed to the "Terrier" gunners but the course and speed of moving targets is also supplied.

On Empire Air Day three of the queerly marked Ospreys will formate at Roborough.

As a representative flying boat (General Reconnaissance) squadron we had chosen No. 209, commanded by Wing Cdr. C. L. Scott, D.S.C., which operates its four-engined Short Singapore IIIs from Felixstowe, sharing the station with the Marine Aircraft Experimental Establishment.

Long-distance reconnaissance, patrol and bombing operations as well as convoy work fall to the lot of the Singapores. It may be as well, incidentally, to explain at this point just how their functions differ from those of the Anson landplanes which equip a large proportion of our general reconnaissance units. The Ansons, having neither the range nor the accommodation of the flying boats, are employed for reconnaissance over comparatively short distances and, if necessary, at higher speeds. They are not "self-contained" like the boat, no provision being made for eating and sleeping (or smoking).

Flying boats fly in formation only on comparatively rare occasions; one of these is Empire Air Day, in a practice for which we have been invited to participate.

Decked with nautical and aeronautical accoutrements we make the perilous descent from the jetty (under the shadow of the famous crane which gives flying boats as much direct lift as they are ever likely to get) into a restless and obviously hard-worked little craft which makes its watery way to each, in turn, of the three Singapores riding at their buoys with one wing-float in the air. Flying boats are like that; they are never quite stable on the water.

Amidships is a sliding gun ring which permits vertical fire over each side of the hull. Through this we descend, handing down a pair of new Williamson camera guns which are to be tried out. In the submarine-like interior are three men who seem to be attired for a rough-and-ready holiday on the Broads. We learn from the pilot that the white sweater is "issue," and that although discipline, as such, is not relaxed on long cruises, special dispensations are made just as on a destroyer or submarine.

The controls are unlocked, and the four Kestrels break into life overhead. Incidentally, as the rear propellers are working in the slip-stream of the airscrews, their engines have a different reduction gear ratio from those in front.

A White Sweater brings a cup of tea, which goes down none the worse for being made with condensed milk. And then we take off.

Of all the thrills of flying (and some are highly overrated) there are few to touch the tremendous exhilaration as a battery of engines quickens to a throbbing thunder and the clean white spray is kicked back from under the chines.

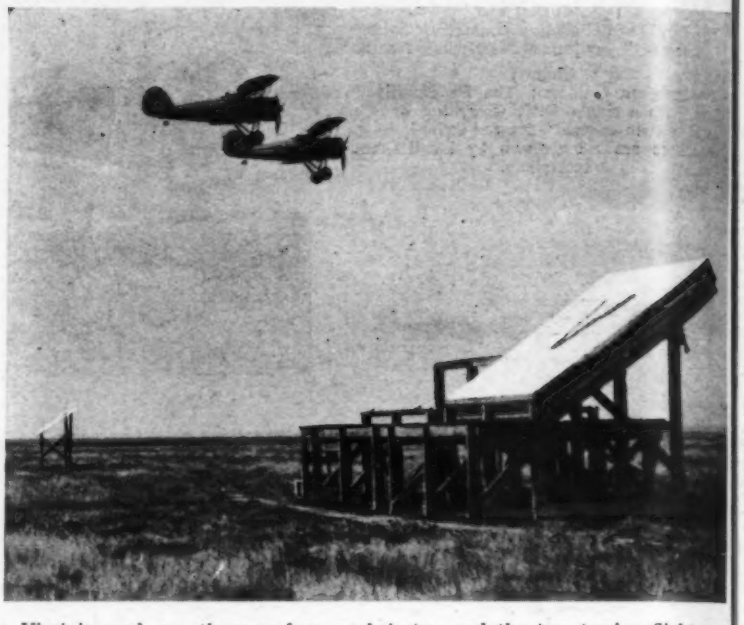
One hand caressing his four throttle levers the pilot flies in as close to the next machine as he can with comfort and safety. A Supermarine Scapa joins us for a spell, then stands on a wing and flies off into the afternoon haze. Grey sea and green Suffolk trail alternately below. After an hour or more we sweep down over the shipping at Parkestone Quay, and three keels cut through the white horses as one. We taxi to moorings on two of our Kestrels.

ESTABLISHMENTS, SCHOOLS, ETC.

FELIXSTOWE, as already intimated, houses the Marine Aircraft Experimental Establishment under Group Capt. E. J. P. Burling, D.S.C., D.F.C., A.F.C. Briefly, the work of the Establishment entails the testing of all new types of British marine aircraft—both military and civil—and experiments with hulls and floats, marine gear and instruments.

Our arrival coincided almost exactly with the transplanting of *Mercury*, the upper component of the Mayo Composite aircraft, on to the back of *Maia*, preparatory to a full-load separation by Service pilots. The actual parting took place towards evening, when the Composite was formated on from a safe distance by a flying boat carrying a Service cine-photographer and the Scion Senior bearing Mr. Lankester Parker, Short's chief test pilot.

Unhappily, some of the most interesting items at the M.A.E.E. were secret. Not so the row of trim 14ft. Inter-



A pair of Gloster Gauntlet single-seaters over the ranges at No. 3 Armament Training Station, Sutton Bridge.

national sailing dinghies, instruction on which is given by the C.O. himself. In Singapore the Group Captain was the moving spirit in a sailing club with about sixty craft.

From Felixstowe we went to near-by Martlesham, where the Aeroplane and Armament Experimental Establishment is commanded by Group Captain H. G. Smart, O.B.E., D.F.C., A.F.C. This Establishment, apart from testing new landplane designs, is responsible for a large amount of experimental work with guns, bombs, sights, etc. Space does not permit a detailed study of the organisation of the Establishment (this was, in fact, dealt with last year), so we will confine ourselves to a few impressions.

It was, to say the least, shattering to find, on arrival, that flying activity was limited, apparently, to a Vickers Virginia and a Valentia. As a matter of fact, these stately old retainers are used as "hacks"; a good deal of flying equipment of much more modern vintage was, we found on investigation, distributed around and inside the hangars. Actual prototypes on test normally represent but a small proportion of the aircraft flying at Martlesham, the majority of machines, like the big Vickers, being used for experiments with equipment or armament. There were assorted Hawkers, including Nash and Thompson-turreted Demons; a new Hispano-engined Fairey Fantome used for experiments with the 20 mm. shell-gun between the cylinder blocks; a training curio in the form of a two-bay Avro Tutor; the Bombay, Hampden, Skua, Don, Oxford, Mentor, Hurricane, Harrow and Whitley IV with Merlins.

The Skua dive bomber fleet fighter was going up for diving tests, but regulations decree that ballast shall be used instead of an air gunner. We were consoled, however, with a trip in the De Havilland Don advanced trainer and communications machine, which has dual control and is powered with a Gipsyking inverted vee-twelve air-cooled engine. The pilot was Sqn. Ldr. J. F. X. McKenna, of the Performance Testing Section, who willingly fell in with our suggestion that, after the machine had been posed for photographs, we should, in his own words, "get a few G on."

Almost a Black-out

For the uninitiated let us explain that "G" represents "gravity" and is used for the measurement of acceleration in tight turns and pull-outs from dives. When sufficiently high it causes a "black-out," or a momentary state of unconsciousness due to the draining of blood from the head.

Our introduction to the higher values of "G" took the form of a sharp pull-out from a dive with the A.S.I. showing 250-odd m.p.h. No luck; we stayed mentally "put." Then a tight loop and some even tighter turns, but never a complete black-out although at times things *did* seem rather grey and far away and the Life Stream was obviously ebbing. But it was a grand ride and gave one tremendous confidence in the Don.

Armament training is given at a number of stations round the coast; our choice was Sutton Bridge where No. 3 A.T.S. is commanded by Wing Cdr. F. O. Soden, D.F.C., who quite apart from his good work in the Service, is a tremendously keen private pilot. Briefly, the work of the station is to tow drogue targets with its Wallaces for the benefit of visiting squadrons and to maintain ground targets on the near-by marshes and a bombing target at the water's edge.

Two squadrons at a time go to Sutton Bridge for a three or four weeks' stay and the two towing flights are kept hard at it.

A hit on the front of a drogue, by the way, counts three points; on the rear portion the score is only one.

As both the visiting squadrons were equipped with Gauntlets the C.O. was good enough to arrange for initiation into the secrets of attacking a drogue. A Sergeant Pilot was accordingly despatched with his target on a "local tow." Up and down the shore flew our quarry, like a docile old hound who permits people to pull his tail for amusement. Not that the Wallace is by any means decrepit, as we found when our pilot began to stand our machine on its nose a thousand or fifteen hundred feet above the target. The timing was superb; at the bottom of each dive the drogue came fluttering out from under our nose in somewhat alarming proximity. Again and again we pulled out and zoomed for an attack from a different quarter.

Stern attacks are made possible by a small auxiliary drogue which deflects the main drogue out of the line of flight of the towing aircraft. At night a searchlight on the range is used to illuminate the drogue.

At the School of Photography, Farnborough (Commanded by Wing Cdr. C. Porri), we looked in on a class to which the intricacies of Service cameras were being lucidly explained. The walls of the building which houses the School are adorned with choice mosaics (not in the archaeologic sense) and other photographic gems which set the pupils a standard to work for.

South Cerney was selected as a typical Flying Training School; it is No. 3 and is commanded by Group Captain D. Iron, O.B.E.

Fifty pupils from the elementary schools are received a term, the averaged period being fifteen weeks. First they go to the Intermediate Training Squadron, which is equipped with Hart Trainers. The curriculum includes solo flying by day and night, elementary formation work, map reading, instrument flying, aerobatics, two long cross-country flights, height tests and instruction in armament, navigation, ground work, etc. At the end of the term, if all goes well, the pupil gets his wings.

Next he is passed to the Advanced Training Squadron for more exacting work on Furies (if he is earmarked for a fighter squadron) and Audaxes. Each term at the A.T.S. culminates with a spell of armament training; after that the pupil is ready for posting.

Great benefits are being derived from the new Link trainers now issued to F.T.S.'s.

We left South Cerney convinced that the training of R.A.F. pilots is in the very best of hands. On our visits to squadrons we saw how amply repaid are their efforts.

COMMERCIAL AVIATION

MID-WING : The New American Bennett monoplane, which may be considered as a small transport or luxury private-owner type, is interesting particularly because it is of mid-wing design and because it is of all wood construction. The engines of the prototype are Jacobs with Hamilton controllables, and the engine cowlings are unique in that there is no obvious gap between them and the nacelles. After its first test flight this machine was landed on its belly without structural damage.

THE WEEK AT CROYDON

"A. Viator's" Weekly Causerie on Transport Affairs at London's Terminal and Elsewhere

GREAT fun is expected to be obtained by all out of *The Highways Development Survey* recently issued by the Stationery Office. Even Croydon Airport is promised a direct motor road which will reduce the time between the Metropolis and the Airport to twenty minutes.

It depends, of course, on what you mean by the Metropolis, for before now coach travellers, within sound of Bow bells, road drills, cement mixers and other urban noises, have thought themselves in London, as indeed they actually were. It is always better to travel hopefully by road than to arrive, but it's not much fun being within three minutes of your London terminus and then sitting in a traffic jam whilst your hair slowly whitens and the girl (for whom you flew across at such speed) gets a job as a stewardess on a ship, does three trips round the world and finally marries the first mate.

Perhaps things will improve when the new road is ready, but the scheme is a thirty-year one, and if Works and Buildings have any say in the matter Croydon will only come up for consideration at the end of the twenty-ninth year, just when they are appointing a committee to enquire why the whole scheme is twenty years behind schedule.

The Committee will naturally be warned against precipitate decisions and there we shall be for another twenty years or so. Anyone of my age at Croydon will feel about as optimistic of seeing the thing through as a recruit, enlisting in the Hundred Years' War for the duration, must have felt about attending peace celebrations and drawing his pension afterwards.

Average Speeds

Still, don't let me discourage you. The *Survey* says that a twenty-minute road journey will increase the average speed of air liners between London and Paris from 160 to 200 m.p.h. It would be difficult to increase the average speed of some air liners which stand still or have a faintly perceptible retrograde movement when confronted with a really hearty breeze.

Three travellers, one an American millionaire, came along to Olley Air Service during last week and said they sort of wanted to spend a month flying around Europe. After placing themselves in Olley's hands they quit worrying and bought large supplies of chew gum and post cards, whilst Capt. Midgeley, their pilot, worked out an itinerary for them. When they saw it, all they said was, "Let's go," and went.

North Eastern Airways have found the London-Glasgow line remarkably good since the Exhibition has been on. They have just taken on a fifth Rapide and have, as well, four Couriers and two Envoys.

On Saturday fifteen members of the French police force came over, by Imperial Airways curiously enough, to visit Scotland Yard and study British police methods—which probably would not do in France, anyway.

Perhaps this highly suspicious movement of troops was responsible for the extraordinary week-end legislation which suddenly required travellers to a certain country to obtain all sorts of passport visas and so forth. So sudden was this that if we had done anything of the sort it would have been called a panic measure. Anyway, it literally caught some travellers "in the air." When they left here nobody knew anything about it, but when they arrived at their destination or halted in the country concerned on their way through they found that they had infringed this brand new regulation.

So good for a country's tourist traffic and so encouraging to business visitors, don't you think?

Another so helpful thing about a week-end stunt of this nature is that it is done when the Embassy concerned with the issue of all this rubber stampery is firmly closed for business purposes.

I'm told that the balloon barrage is to be on show on Empire Air Day at Cardington. Air line pilots might be well advised to go and have a good look at it, so that they will know what they are tangled up with when they meet bits of it floating free and dragging thousands of feet of steel cable. I must say, though, that the Cardington Bo-peep Corps has kept its flock in fairly good order recently.

The Auxiliary Air Force machine which recently landed at Biggin Hill in error for Kenley and was reported missing, has created some uneasiness in lay minds. The pilot and passenger apparently never knew which aerodrome they had put in at, until informed hours and hours later by the B.B.C. People are asking whether air line pilots don't do the same thing.

The answer is, of course, that some confusion might arise any time between, say, Prague and Peebles, Aberdeen and Amsterdam, Hanover and Hooton or Zlin and Zetland. Passengers, forty of them, might wake up next morning in their hotel and flatly refuse to believe the waiter, despite his native birth, when he assured them that this was not Berlin but definitely Bootle.

Sub-Arctic

A PRIVATE company has been founded at Akureyri, in Iceland, to operate an airline between that city and the capital, Reykjavik. The company has purchased a four-seater Waco floatplane, and it is understood that the Government will send a sufficient portion of inland mail over this route to make the service pay.

Well-intentioned Advice

FOLLOWING a *Notice* dealing with different conditions in which violent air disturbances are found, the Air Ministry has continued the good work by publishing a *Notice to Airmen*, explaining the need for great care in the setting and reading of altimeters. It is suggested that they should always be adjusted to give heights above sea level except, of course, when an approach is being made into an aerodrome. Then the altimeter would naturally be set to the barometric pressure prevailing.

The *Notice* suggests a complete procedure which should be a useful guide at least to those pilots who are comparatively new to the business of transport flying. The suggestions are followed by an example involving a flight from Renfrew to Gravesend using altimeters both with and without pressure scales.

COMMERCIAL AVIATION (CONTINUED) : WORLD NEWS

Co-operation in Canada

CANADIAN operators along the north shore of the St. Lawrence River and in the mining regions of northern Quebec have made an agreement to eliminate the duplication of services. Canadian Airways and Dominion Skyways announced early in May that keen competition for freight and passenger traffic in the northern Quebec country has resulted in falling rates, and operators have been unable to realise a "reasonable return." As a result, the two companies are laying out services so that they will not conflict and in some cases are going to pool these services.

Fifteen to Paris

THREE competing companies—who are on the best of terms with each other—on the London-Paris route now run an aggregate of fifteen services a day in each direction. At this rate there may soon be as much traffic across the Channel by air as by sea. Five of the fifteen services are operated by Air France, using Marcel Bloch 220s, and the schedule of one hour and a quarter which they have introduced has had a welcome from the public which is reflected in their bookings. During April, 3,007 passengers were carried by Air France, as against 1,870 in April, 1937—an increase of 60 per cent.

K.L.M. to Australia

THE first K.L.M. machine to connect with the new K.N.I.L.M. service between Batavia and Sydney will start from Amsterdam on June 28 (or London on June 27) and arrive in Sydney on July 5. The K.N.I.L.M. service will be run twice weekly with Lockheed 14s, and the route across Australia will be similar to that at present used by Qantas, who expect to be operating flying boats during this summer.

The K.N.I.L.M. time-table has been arranged so that the times of arrival in Brisbane and Sydney permit passengers to reach other destinations on the same day. The time for the through service from London to Sydney or Brisbane will be seven and a half days in the homeward direction and eight days in the outward direction.

Extension in Denmark

DURING last year the internal services operated by D.D.L. in Denmark were those between Copenhagen and Aalborg and Copenhagen and Esbjerg, but on June 1 an additional service will be inaugurated between Aalborg, Silkeborg, Esbjerg and Hamburg.

The service will be operated by a sixteen-passenger Fokker F12 and a six-passenger D.H. Dragon Rapide. On the occasion of its inauguration, an international flying meeting will be held three days previously—next Sunday—at Aalborg, where the new airport will be officially opened.

Single-engined

SOME interesting and useful information has been given out by the Czechoslovakian transport company, C.L.S., after one of their machines had suffered engine trouble between Croydon and Amsterdam. The machine concerned, a D.C.3, was carrying a crew of four, seven passengers and nearly 900 lb. of freight. About midway between the English and Dutch coasts, while the machine was flying at 3,600ft., an oil leakage from the starboard engine was noticed. The pilot started to gain height while both engines were still functioning, but at 5,000ft. the oil pressure warning-light glowed and the engine was switched off.

For the rest of the flight to Rotterdam, a period of nearly one hour and a half, the single Cyclone G was run at 68 per cent. full power, with 30in. of manifold pressure showing at 1,800 r.p.m. The cylinder-head temperatures remained at a reasonable figure and the airscrew of the defective engine was changed to coarse pitch in order to reduce drag. After maintaining height at 5,000ft. the machine was climbed to rather more than 6,000ft. and was flown thereafter at an indicated speed of 112 m.p.h. After landing at Rotterdam it was found that an oil tank vent plug had been lost and that all the oil had drained out.

Apart from the effect of the report in proving that the D.C.3 can be flown satisfactorily on one engine, it is significant that C.L.S. have made no bones about admitting the failure. In such cases all air transport companies might consider that honesty can be the best policy. Provided that the reason for an accident, a forced landing or an "incident" of this nature is known, the public is likely to be far less alarmed.

The Belgrade Expedition

IN our report of the Finnish Aero Show it was mentioned that the entire German exhibit, among others, would be transferred at the end of the month to Belgrade. Here, between May 28 and June 13, will be held Serbia's first international air exhibition. Among the stands is one in which the United States will be represented.

A New Danger

IN view of the number and complexity of the *Notices to Airmen*, giving details of the night flying which is being carried out, without navigation lights, in various parts of the country, it is not surprising that the Air Ministry has seen fit to issue another *Notice* (No. 91 of this year) to explain that cases have been reported in which fatal accidents have been narrowly averted, and imploring other pilots to pay due regard to the *Notices* concerned.

Obviously, there must be occasions when the pilot who is flying an unlighted machine does not see another machine which is being flown on its ordinary business until it is almost too late to switch on his own navigation lights. In many cases, too, the pilots of two machines concerned have totally different fields of view, and are consequently unaware of any narrow escape they may have had. If a few cases have been reported, there must have been dozens which have not been reported and not even realised. One supposes that this unlighted night flying is entirely essential, but it is difficult to feel sympathy for anybody except the commercial or other pilot whose own and whose passengers' lives are being endangered. The situation must simply be suffered with a good grace. Such is the cost of civilisation.

However, a paragraph in the new *Notice* explains that the fact of abandonment of unlighted flying in certain areas will in future be broadcast by radio from Croydon and/or Heston.

R.A.S. Summer Services

RAILWAY AIR SERVICES have now started their augmented and (in several cases) speeded-up summer services. Since Monday, May 23, London-Belfast has been increased to two services per day in both directions, the route being London (Croydon), Birmingham (Castle Bromwich), Manchester-Liverpool, and Belfast (Harbour Airport). The morning service calls at Liverpool, and connecting services are being operated by the Isle of Man Air Services, Ltd., to and from Manchester and the Isle of Man. The afternoon service calls at Birmingham, Manchester, Liverpool, and the Isle of Man, and affords connection with Glasgow.

Connections with Scottish Airways are offered at Glasgow, a through air journey in 6 hours 40 minutes from the Outer Hebrides to London being available. Scottish Airways' services to and from Campbeltown and Islay also connect. There are also three services in both directions on week-days (two on Sundays) between Belfast and Glasgow. Connections are made in Glasgow with Scottish Airways' services from the Shetlands and Orkney Islands.

There is a week-day service in both directions between Bristol and Cardiff.

On the South Coast route, which has been operated by three services in both directions between Brighton, Isle of Wight (Ryde), Southampton and Bournemouth, four services in both directions are given with four services on Sundays from June 5 and two additional week-day services on Mondays and Saturdays, and daily from July 4.

From June 26 there will be a Sunday service in both directions between Cardiff, Bristol, Southampton and Ryde, with connections to Brighton, Hove and Worthing.

The present direct week-day service in both directions between London, Liverpool and Glasgow continues.

Starting last Monday, a north and south service is being operated between Manchester and Brighton, calling at Liverpool, Birmingham, Bristol, Southampton and Ryde. There is a morning service from Manchester at 8.55 a.m. and a return service leaving Brighton Airport at 4.35 p.m. Calls are made at Cheltenham and Gloucester on request.

A faster service is operated between Bristol and Plymouth, calling at Cardiff and Exeter. There is a morning departure from Bristol at 11 a.m. and a return from Plymouth at 4.45 p.m.

An additional cross-channel service between Cardiff and Bristol is run daily.

Sunday services will begin on June 26, when South Wales will be linked with resorts on the South Coast by a morning service, leaving Cardiff at 10.5 a.m, for Ryde. The machine will call at Bristol and Southampton.

SUBSIDIES in the FUTURE

"Implementing" the Cadman Committee's Recommendations : A Pleasant Surprise for Internal Airline Operators : The New Licensing System

THERE is no doubt that Sir Kingsley Wood's promise in the House on Wednesday of last week that our internal airlines should receive a proportion of the additional subsidy for civil aviation came as something of a surprise to the majority of those not intimately concerned with the political side of air transport. The Cadman Committee had recommended an increase of £1,500,000 in the maximum sum to be made available for the assistance of civil aviation, but had rejected the idea of subsidising internal airlines. The Government has gone one better and offered a fifteenth of the total for the first year—a matter of £100,000—this subsidy decreasing during the next five years. In this way it is hoped that development will be stimulated, yet not by impairing the will to self-support in the years to come.

The rest of the total sum will be divided into two portions, one of which, approximately £1,000,000, will be allocated to Empire and other routes outside Europe, while the remainder, a matter of £400,000, will go to help the much-neglected European routes.

Some of the ex-European subsidy will go to help the New Zealand extension of the Empire service to Australia, the development of a trans-Pacific service on competition with that which has already been experimentally operated by Pan-American Airways, and, possibly, towards the development of new services in the West Indies. In Europe it was hoped that new services would be operated to Berlin, Amsterdam, Prague, Vienna, Budapest, Oslo and Lisbon, and that the present service to Switzerland would be run throughout the year. Eventually it was expected that few of the European capitals would be outside the British airline network. Sir Kingsley explained that all foreign civil aviation to-day was heavily subsidised, and that more money would be needed if we were to keep our place.

One of the primary objects of any aviation subsidy, of course, is to provide the necessary incentive for the manufacture of civil machines in sufficient quantity and of a sufficiently advanced design to interest the foreign and Dominion market. Sir Kingsley said that the Government desired that British machines should eventually be used on all the services, and he mentioned that a promising type of all-metal medium-sized liner would be on the market early in 1939, and the possibility of assistance for the development of this machine was being considered. The Air Ministry had also invited definite proposals from constructors, after consultation with our two major operating companies, for a ten-passenger machine with a range of 1,800 miles for use on such services as those to Berlin, Copenhagen and Lisbon. A type of land-plane to succeed the Albatross was also being considered for use on long-distance oceanic and other services.

Temporary Assistance

In his statement about the £100,000 subsidy for internal airlines, he said that assistance was being given on the clear understanding that the companies must establish themselves on a sound paying basis during the five assisted years, and that thereafter no subsidy could be expected. Another condition of the subsidy was that at least 75 per cent. of the pilots employed on these services should be in the Royal Air Force Reserve.

When he rose to make his first speech as Secretary of State for Air in moving that the Air Navigation (Financial Provisions) Bill should be read a second time, Sir Kingsley was duly applauded, and after he had spoken members from both sides welcomed both his appointment and that of Capt. Balfour as his Under-Secretary.

In the course of the debate which followed, general satisfaction with the arrangements were shown, and practically the only criticism came from the Socialist benches with the suggestion that civil aviation should be nationalised. MR. MONTAGUE was the first member to put this argument forward, and he said that the principle of giving Government aid to firms operating for private profit was illogical. He referred to the "monopolistic character" of the industry, and said that the business of civil transport was recognised by the Government as a virtual monopoly. He stressed the point that only one or two companies obtained public money while others were left out. Such discrimination, he thought, strengthened the case for public ownership.

SIR HUGH SEELY said that, although the Bill was a direct outcome of the Cadman Report, he did not think that the Committee could, in the short time taken, have gone fully into the whole subject, and he hoped that the Air Ministry would not be bound by its report. He wanted the new Air Minister to go into the whole question of civil aviation in order to see whether greater co-ordination was possible and whether new services could be given additional powers for expansion. He did not want civil aviation to be tied to the old methods of subsidy. There was a danger that the vested interest in Imperial Airways and various other companies would be able to push out any new undertakings. Private enterprise could not be defended in such circumstances.

LT.-COL. MOORE-BRABAZON came a little nearer to Mr. Montague's suggestion when he said that, while he was not in favour of the nationalisation of air transport at present, the conditions in the industry made it one of the border-line cases since it was not yet paying for itself. There would be no appreciably greater difficulties in taking over civil transport in years to come than there were at present, and in the meantime its development would best come about under the fire of private competition. He made a special plea for the development of the technical side, which was inclined to suffer, since the industry concerned had a very limited market. He cited the case of the compression-ignition engine in this connection, and went on to describe rather luridly the consequences of the fire risk. If this country could develop a successful compression-ignition engine British civil aviation, he thought, would be supreme throughout the world.

Imperial Criticism

MR. GARRO JONES, referring to the question of State control, gave broadcasting as an example of its success. Although there had been a departure from the principle under which Imperial Airways had been made the chosen instrument, this was only a nominal departure because the monopoly had really only been broken down in the case of a few internal airlines. He did not see why it was necessary that the shareholders of such a private concern as Imperial Airways should be benefited by a subsidy increase, and he spoke at some length in explanation of the financial and subsidy arrangements of this company since it was formed in 1924. He explained how a meteorological organisation had been placed at the company's disposal, how diplomatic facilities had been given to them, and how they received special grants for fleet modernisation and from the P.M.G. for the carriage of mails, yet no less than £46,000,000 would be received by this company and British Airways during the next fifteen years. It would be difficult, he thought, for the Air Ministry to prove that Imperial Airways had been a shining example of efficiency in the realm of private enterprise, and went on to explain where he thought this company had failed in its methods, particularly those relating to propaganda. He thought that if we were to obtain a place in the world's civil air transport Imperial Airways would need to be taken out of the hands of the small body of private individuals who manage the company to-day.

MR. R. ROBINSON agreed with Sir Hugh Seely that the Government should not be tied down to the recommendations of the Cadman Committee and that they should not take up an attitude of complacency. Since good money was being paid to Imperial Airways and British Airways, he hoped that it would be seen that they gave equally good value for it, and asked whether other companies, who have done a great deal of pioneering work, would be allowed to come into the picture. He wondered whether the welcome internal subsidy, though small, would be given only to one licensed operating company.

COL. ROPNER simply asked whether the Under-Secretary of State would make a clear and definite statement in the matter of Government policy concerning the subsidy for external airlines. He had been told that it was the policy of the Air Ministry to limit subsidies on such services to one company.

and he hoped that British Airways, against which company he had no complaints to make, would not be given such a monopoly. Although he agreed that it was unsatisfactory for a large number of competing concerns to be flying in Europe, he thought that there should at least be more than one. Three other companies were mentioned by Col. Ropner as suitable recipients for at least a part of the subsidy. One of them, West Coast Air Services (*i.e.*, Olley Air Service), were preparing to operate a new service to Luxembourg. If a subsidy was being given, financially sound and efficient companies other than British Airways should receive a share of it.

MAJOR PROCTOR gave examples of the failure of State control in various enterprises and said that his party believed that State ownership was a question of wisdom and expediency. The proper function of the Government was not to own or to manage air services, but to make regulations for the safety of those who used them. All developments and inventions had been brought about by private enterprise. He asked whether the Under-Secretary was quite satisfied that there was no interference with the air services by the railway companies.

MR. PICKTHORN emphasised the need for compression-ignition development, and stressed the importance of the British West Indies as an area where new lines should be developed. An attempt had been made to establish such air lines soon after the War, but lack of a subsidy, coupled with the smallness of the Colonial units involved, prevented these lines from being a success. He suggested that competition over the Pacific would be ill-judged and probably unsuccessful, and said that, beyond our main trunk lines, we should concentrate on starting more feeder lines. He thought that more support ought to be given to private flying and that money spent in this way would be more useful than that spent on internal airlines.

A Good Word

MR. LYONS reminded the House that whatever might be said about the European routes Imperial Airways had done their work very well on the Empire routes. He asked what sum would be set aside for the Australia-New Zealand service, and whether a condition was made that there should be reciprocal arrangements with any joint operating company. Apparently we would, for instance, never be granted permission to use the Hawaiian Islands for the Pacific service. He asked how the internal airline subsidy was to be distributed and what help was to be given to municipal airports. Finally, he asked a number of questions about the future of the Empire services and, in particular, of the Short Mayo Composite.

MR. D. ADAMS brought up his guns in defence of State or municipal ownership and asked that the Government should spend a proportion of the internal subsidy on the light aeroplane clubs. He suggested that the licence subsidy figure for every pilot should be raised from £25 to £40 so that clubs could train pilots for nothing. Such a move would provide an additional reserve of pilots at small cost.

MR. PERKINS congratulated the new Air Minister on tearing up a page of the Cadman Report and the whole of the Maybury Report within the first twenty-four hours of his appointment, thus giving the necessary encouragement to internal operators. He asked the Under-Secretary if any of the dismissed pilots had been offered employment by any of the companies concerned; whether any steps had been taken by Imperial Airways to set up a Whitley council; whether the London-Paris pooling scheme had made any progress; and whether it was possible to say which companies would be eligible for subsidy.

SIR MURRAY SUETER also asked about the Short Mayo and how the North Atlantic services were progressing. He asked the Air Minister to speed up the South American developments and to look into the whole question of air services in the West Indies. In connection with the Pacific service he reminded the House of the accident to the *Samoan Clipper* and hoped that the diesel engine would be developed for long-distance work in time. He asked whether any share of the internal subsidy would go to help the Newcastle-Stavanger line which, he understood, had previously been refused a subsidy. He also hoped that the Langstone Harbour plans would be given due attention, and added that considerable difficulties had been experienced with the Southampton Base at present used.

Explanations

CAPT. HAROLD BALFOUR, the new Under-Secretary of State for Air, explained that it was not for him to discuss the problem of State control versus private enterprise, but that the Government had decided that private enterprise, controlled and limited by the State, should be the principle in the development of civil aviation during the period in which the present agreements were to run. Some discrimination in subsidy grant was obviously necessary because of the different conditions under which the various operating companies were working. Imperial Airways, for instance, must have a privileged position. He explained that the subsidy would not be available for compression-ignition research, but that money was available under the civil aviation vote for this particular purpose. He agreed with the necessity for its development, but said that, at present, the petrol engine was very much more efficient. The Germans had had a certain amount of success with their diesels, but none were in regular use on German air lines. The dividends of Imperial Airways averaged 4½ per cent. during thirteen years and indirect subsidies had been taken into consideration when the financial arrangements were made. The mail payments were for services rendered and on a normal scale. In the meantime the risk of loss was being borne by individual shareholders rather than by taxpayers in general.

The whole question of civil aviation was being examined and the Government would not be tied by the recommendations of the Cadman Committee. All companies would be eligible for a subsidy, though it should be remembered that any successful company would need to accept the obligation of having a Government director on its board. He was in entire sympathy with other members on the question of pilots' pay. He wanted to see that commercial aviation should provide a career which would not be confined to flying activities and did not see why, in the future, the pilots' pay should not be represented by something like 85 per cent. as basic salary and 15 per cent. as payments on results. He could give no information as to the way in which the internal subsidy would be divided and the formation of a joint operating company for the London-Paris route was still under consideration.

The importance of air services in the West Indies was realised and the matter was being examined. The trials of the Mayo Composite had been satisfactory and it was hoped that the upper component would be crossing the Atlantic during the present summer. He agreed that it was necessary to proceed immediately with the Empire Air Base and he proposed to go to Langstone Harbour himself quite shortly.

The position of the flying clubs would be looked into in relation to their training value for defence purposes and the same could be said of private and municipal aerodromes. Where these were important for defence purposes it might be possible to provide some form of assistance.

In order to see whether pilots would prefer to be represented by a domestic committee or by the Pilots Association, a ballot in Imperial Airways was about to be taken. Of the five dismissed pilots interviewed by the Government directors two had been favourably considered and one recommendation made for reinstatement, either with Imperial Airways or with a joint company, but for technical reasons the company was not able to agree to this reinstatement. It was not fair to say that the pilots had been condemned in the dark.

The motion for rejection was negatived by 173 votes to 108 and the Bill was read a second time.

Licensing Problems

After SIR KINGSLEY WOOD had moved that an address be presented to His Majesty in pursuance of sub section (3) of Section 5 of the Air Navigation Act, 1936, praying that the Air Navigation (Licensing of Public Transport) Order, 1938, be made in the terms of the draft laid before Parliament, MR. WEDGWOOD BENN asked for some information about the licensing arrangements. It was extremely important, he said, that they should know exactly what the relations between the licensed firms and their employees were likely to be. He suggested that the Airline Pilots' Association, for instance, should be allowed to approach the licensing authority to say whether or not a particular firm was fit to receive a licence. The pilots were the most important people concerned.

MR. R. ROBINSON asked whether it was intended to put a stop to the ban on airline bookings, or whether the Railway Clearing House, as an outside body, would be able to keep up the ban in spite of the section in the Order which would prevent companies from placing such a ban. He also asked about the position of charter companies under this licensing order.

MR. PERKINS asked about the question of appeal against the ruling of the Authority and about the costs involved for a company when, and if, frivolous or vindictive opposition was lodged. He asked when the booking ban would finally be lifted.

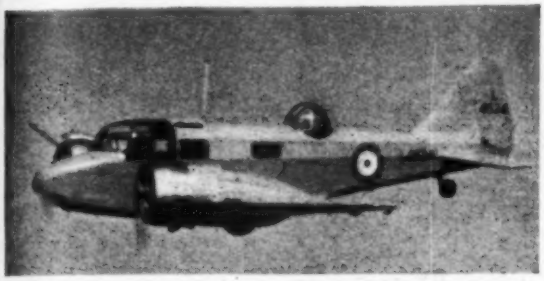
CAPT. BALFOUR said that employees of operating companies were adequately safeguarded by the fact that anyone granted a licence had to apply the Fair Wages Clause. He gave an assurance that the booking ban would be entirely lifted when the Order came into operation—which would be within a month or two. Charter operators were included in that Order, but ordinary joy-riding firms were not. In the matter of appeals the licensing authority would be an impartial body, but legal redress would be available.

The Attorney General (SIR DONALD SOMERVELL) explained that it would be contrary to precedent to give to any but a recognised court the power to award costs, but the number of people who could object was limited and the licensing authority would be able to see when objections were frivolous.

The Motion was agreed to.

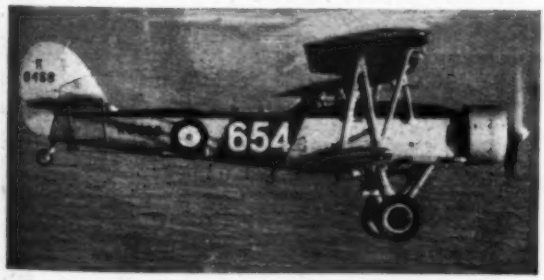
IN SERVICE TO-DAY

Current R.A.F. Types, the Majority of Which Will be Seen on Empire Air Day



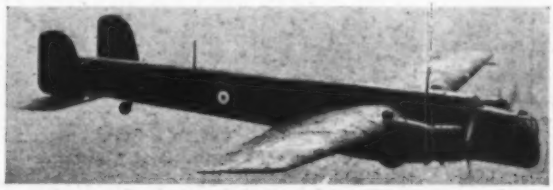
AIRSPEED OXFORD : Advanced trainer (two Cheetah X engines—350 h.p. each at 7,600ft.) ; span, 53ft. ; gross weight, 7,300 lb. ; max. speed, 185 m.p.h. at 7,500ft.

AVRO TUTOR : Trainer (Lynx IVC engine—240 h.p. at sea level) ; span, 34ft. ; gross weight, 2,458 lb. ; max. speed, 122 m.p.h.



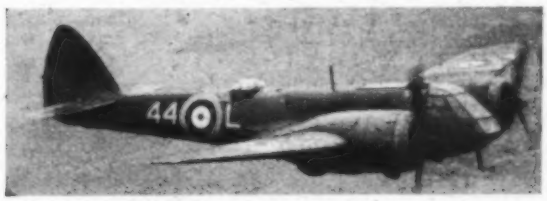
BLACKBURN SHARK : Torpedo-spotter-reconnaissance (Tiger VI engine—810 h.p. at 5,000ft.) ; span, 46ft. ; gross weight, 7,870 lb. ; max. speed, 152 m.p.h. at 5,500ft.

DE HAVILLAND TIGER MOTH : Trainer (Gipsy Major engine—130 h.p. at sea level) ; span, 29ft. 4in. ; gross weight, 1,825 lb. ; max. speed, 109 m.p.h.



ARMSTRONG WHITWORTH WHITLEY II and III : Bomber (two Tiger VIII engines—760 h.p. each at 12,750ft.) ; span, 84ft. ; gross weight, 21,660 lb. ; max. speed, 215 m.p.h. at 15,000ft.

AVRO ANSON : General reconnaissance (two Cheetah IX engines—350 h.p. each at 6,000ft.) ; span, 56ft. 6in. ; gross weight, 7,650 lb. ; max. speed, 188 m.p.h. at 7,000ft.

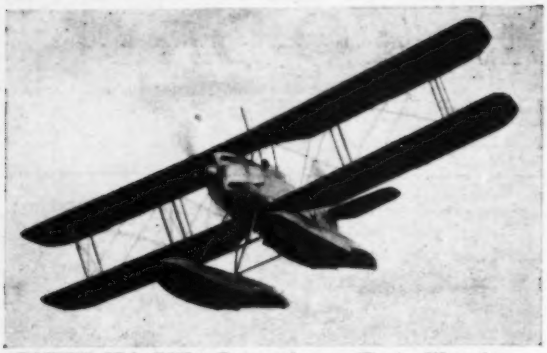


BRISTOL BLENHEIM : Bomber (two Mercury VIII engines 840 h.p. each at 13,000ft.) ; span, 56ft. 4in. ; gross weight, 12,030 lb. ; max. speed 280 m.p.h. at 15,000ft.

FAIREY BATTLE : Bomber (Rolls-Royce Merlin II engine —1,050 h.p. at 16,250ft.) ; span, 54ft. ; gross weight, 10,775 lb. ; max. speed, 257 m.p.h. at 15,000ft.

FAIREY SWORDFISH : Torpedo-spotter-reconnaissance (Pegasus III engine—750 h.p. at 3,500ft.) ; span, 45ft. 6in. ; gross weight, 7,720 lb. ; max. speed, 154 m.p.h. at 4,000ft.

Service Aircraft (Continued)



FAIREY SEA FOX : Reconnaissance (Rapier VI engine—395 h.p. at 6,000ft.) ; span, 40ft. ; gross weight, 5,420 lb. ; max. speed, 124 m.p.h. at 5,860ft.

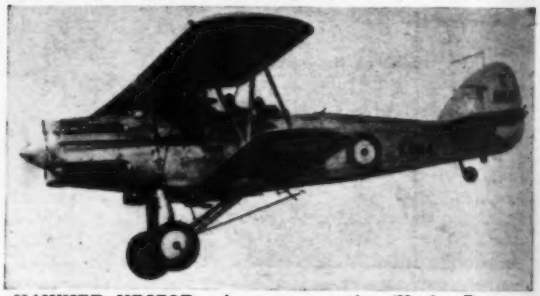
GLOSTER GLADIATOR I : Fighter (Bristol Mercury IX engine—840 h.p. at 14,000ft.) ; span, 32ft. 3in. ; gross weight, 4,750 lb. ; max. speed, 253 m.p.h. at 14,500ft.

HAWKER HIND : Bomber (Kestrel V engine—640 h.p. at 14,000ft.) ; span, 37ft. 3in. ; gross weight, 4,958 lb. ; max. speed, 186 m.p.h. at 16,400ft.

HAWKER DEMON : Fighter (Kestrel V de-rated engine—625 h.p. at 12,000ft.) ; span, 37ft. 3in. ; gross weight, 4,490 lb. ; max. speed 185 m.p.h. (approx.) at 15,000ft.

GLOSTER GAUNTLET II : Fighter (Mercury VIS engine—645 h.p. at 15,500ft.) ; span, 32ft. 9½in. ; gross weight, 3,970 lb. ; max. speed, 230 m.p.h. at 15,500ft.

HANDLEY PAGE HARROW II : Bomber (Two Pegasus XX engines—925 h.p. each at 10,000ft.) : span, 88ft. 5in. ; gross weight, 23,500 lb. ; max. speed, 200 m.p.h. at 10,000ft.

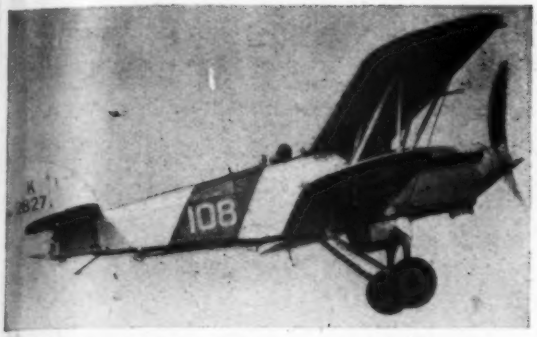


HAWKER HECTOR : Army co-operation (Napier Dagger III engine—805 h.p. at 5,000ft.) ; span, 37ft. 3in. ; gross weight, 4,887 lb. ; max. speed, 187 m.p.h. at 6,560ft.

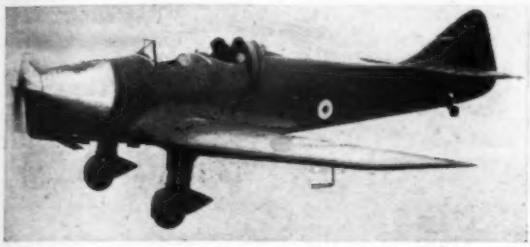
HAWKER FURY : Fighter (Kestrel V engine—640 h.p. at 14,000ft.) ; span, 30ft. ; gross weight, 3,609 lb. ; max. speed, 223 m.p.h. at 16,400ft.

HAWKER HURRICANE : Fighter (Merlin II engine—1,050 h.p. at 16,000ft.) ; span, 40ft. ; total weight (approx.) 6,000 lb. ; max. speed, 335 m.p.h. (approx.) at altitude.

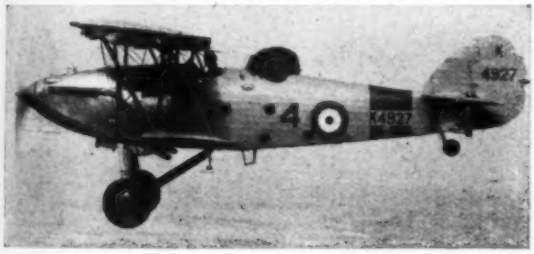
Service Aircraft (Continued)



HAWKER NIMROD : Fleet fighter (Kestrel IIS engine—550 h.p. at 13,000ft.) ; span, 33ft. 6½in. ; gross weight, 4,042 lb. ; max. speed, 181 m.p.h. at 16,400ft.



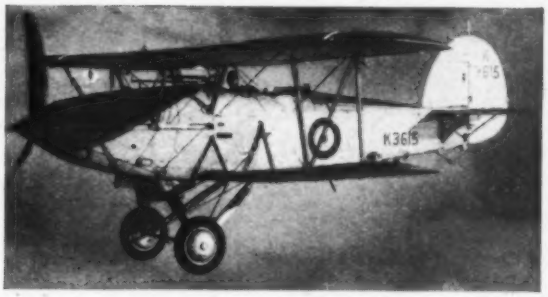
MILES MAGISTER : Trainer (Gipsy Major engine—130 h.p. at sea level) ; span, 33ft. ; gross weight, 1,825 lb. ; max. speed, 145 m.p.h. at 1,000ft.



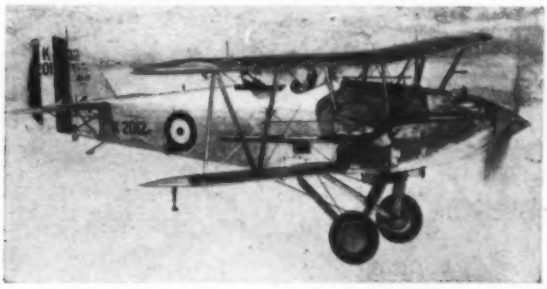
HAWKER HART : Trainer (Kestrel X engine—550 h.p. at 3,000ft.) ; span, 37ft. 3in. ; gross weight, 4,085 lb. ; max. speed, 180 m.p.h. at 3,000ft.

SHORT SINGAPORE III : Reconnaissance flying boat (two Kestrel IX and two Kestrel VIII engines—730 h.p. each at 5,250ft.) ; span, 90ft. ; gross weight, 27,500 lb. ; max. speed, 145 m.p.h. at 2,000ft.

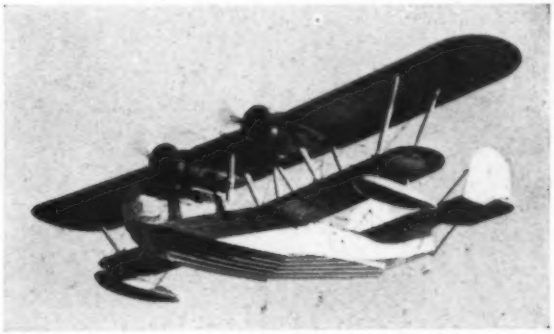
VICKERS WELLESLEY : Bomber (Pegasus XX engine—925 h.p. at 10,000ft.) ; span, 74ft. 7in. ; gross weight, 12,500 lb. ; max. speed, 220 m.p.h. (approx.) at 10,000ft.



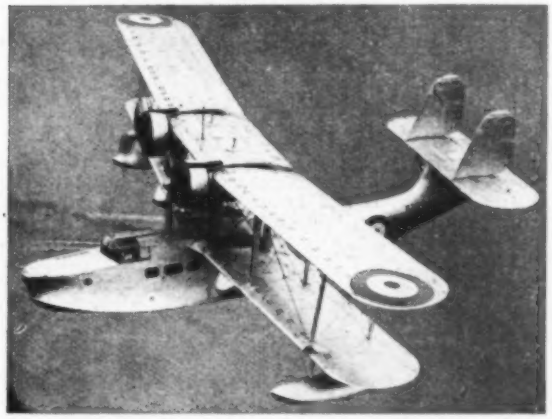
HAWKER OSPREY IV : Fleet fighter reconnaissance (Kestrel V engine—640 h.p. at 14,000ft.) ; span, 37ft. ; gross weight, 4,970 lb. ; max. speed, 173 m.p.h. at 16,400ft.



HAWKER AUDAX : Army co-operation (Kestrel X engine—550 h.p. at 3,000ft.) ; span, 37ft. 3in. ; gross weight, 4,381 lb. ; max. speed, 170 m.p.h. at 3,280ft.

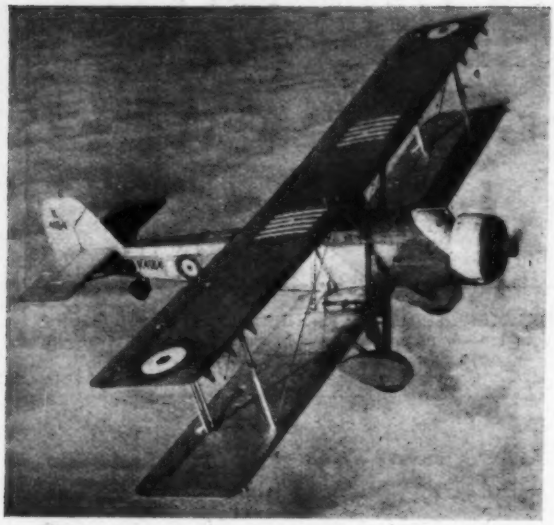


SAUNDERS ROE LONDON : Flying boat (two Pegasus X engines—875 h.p. each at 6,250ft.) ; span, 80ft. ; gross weight, 22,000 lb. ; max. speed, 155 m.p.h. at 6,250ft.



SUPERMARINE STRANRAER : Flying boat (two Pegasus X engines—850 h.p. at 4,000ft.) ; span, 85ft ; gross weight, 19,000 lb. ; max. speed, 165 m.p.h. at 6,000ft.

Service Aircraft (continued)

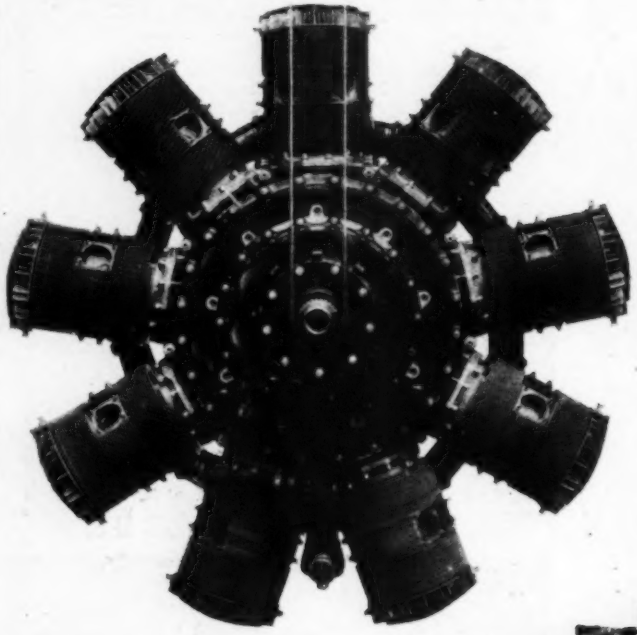


(Left)
VICKERS VILDEBEEST : Torpedo bomber (Pegasus IIM engine—635 h.p. at 5,000ft.) ; span, 49ft. ; gross weight, 8,100 lb. ; max. speed, 142 m.p.h. at 4,930ft. (Picture shows Vildebeest IV with Perseus engine.)

SUPERMARINE WALRUS : General purpose, amphibian flying boat (Pegasus VI engine—750 h.p. at 3,500ft.) ; span, 45ft. 10in. ; gross weight, 7,200 lb. ; max. speed, 135 m.p.h. at 4,750ft.

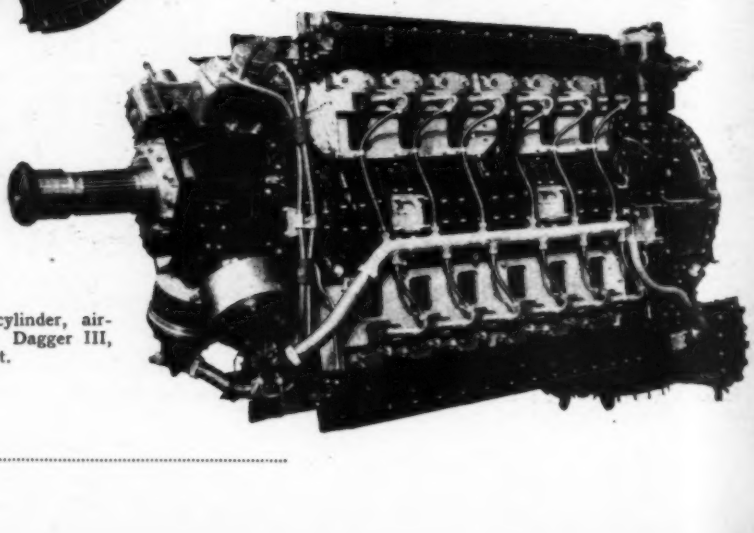
All foregoing power figures represent the maximum output of one engine.

REPRESENTATIVE ENGINES



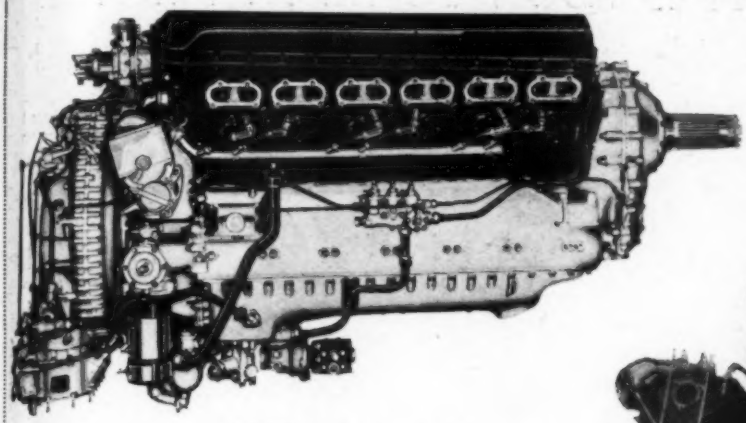
Bristol Perseus VIII, sleeve-valve, nine-cylinder radial ; rating, 670 h.p. at 5,000ft. Other marks are the VI, IX, and XII and fully supercharged X. Max. output, Perseus XII, 905 h.p. at 6,000ft.

Cheetah X, nine-cylinder radial. Normal rating, 341 h.p. at 7,000ft. ; max. 350 h.p. at 7,500ft. ; take-off, 375 h.p.



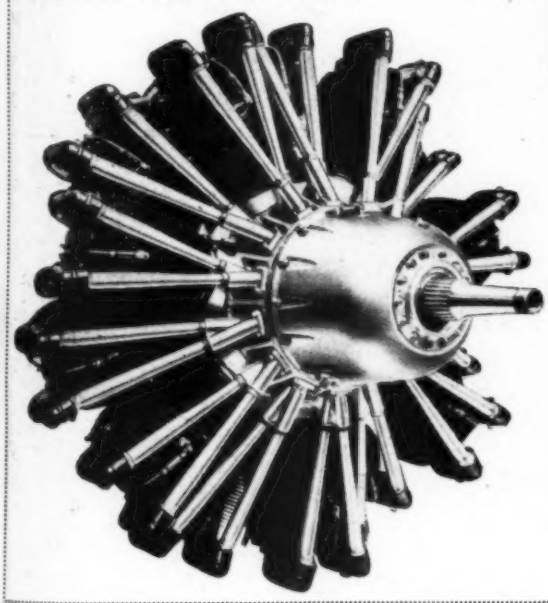
Napier Dagger VIII, twenty-four cylinder, air-cooled engine (no figures released). Dagger III, rating, 725 h.p. at 3,500ft.

Engines (Continued)



(Left)
Rolls-Royce Merlin II, twelve-cylinder, liquid-cooled. Rating 990 h.p. at 12,000 ft.; max. 1,050 h.p. at 16,000 ft.; take-off, 890 h.p. Merlin I figures are similar and Merlin III and M.S. engines have been developed. Merlin X with two-speed supercharger, 1,040 h.p. at 2,500 ft. and 965 h.p. at 13,250 ft.

(Below)
Armstrong Siddeley Tiger VIII two-row, fourteen cylinder radial with two-speed supercharger. Normal ratings, 840 h.p. at 6,200 ft. and 756 h.p. at 12,800 ft.; max., 782 h.p. at 15,000 ft.; take-off, 918 h.p. The Tiger IX is medium supercharged, max. output 805 h.p. at 6,250 ft.



(Above)
The Bristol Pegasus XVIII nine-cylinder radial with two-speed supercharger. Normal ratings, 884 h.p. at 5,000 ft. and 800 h.p. at 15,500 ft.; max., 900 h.p. at 17,750 ft.; take-off, 980 h.p. Other recent Pegasus models are the XX, fully supercharged, max., 925 h.p. at 10,000 ft.; and the XXII, medium supercharged, max. 915 h.p. at 6,250 ft.; take-off, 1,010 h.p. The rather smaller nine-cylinder Mercury is fully supercharged as the VII and IX (rating, 830 h.p. at 13,000 ft.) and medium supercharged as the XI and XII (rating 820 h.p. at 3,500 ft.).

EMPIRE AIR DAY—A WEEK EARLY

DONCASTER'S airport held its Empire Air Day Display last Saturday. The date had been advanced one week so as not to interfere with the Summer Race Meeting, an important local event which takes place next Saturday. It would, however, have been difficult to choose a better day for the job. Over twelve hours' sunshine were recorded, and a very large crowd were present during the afternoon and evening. The number of turnstiles at the entrances had to be increased from five to eleven, and it is hoped to hand over about three hundred pounds to the Benevolent Fund.

In the aircraft parks the public were able to inspect examples of many of the latest R.A.F. machines, and a representative collection of civil aircraft.

The flying programme was also of a very high standard. Individual aerobatics were carried out by a Hawker Hind, a Gloster Gauntlet, and a Comper Swift, while a flight of Furies of No. 41 (F) Squadron gave a display of flight aerobatics. This was undoubtedly the outstanding item of the whole afternoon, though the attention of the spectators was held throughout the display by one or other of the fifty-five aircraft which were present.

Over two hundred people took joy-rides with North-Eastern Airways, and the Mayor of Doncaster flew with Capt. Anderson in a Rapide and addressed the public by relayed radio-telephony.

The Weir Aero Engine

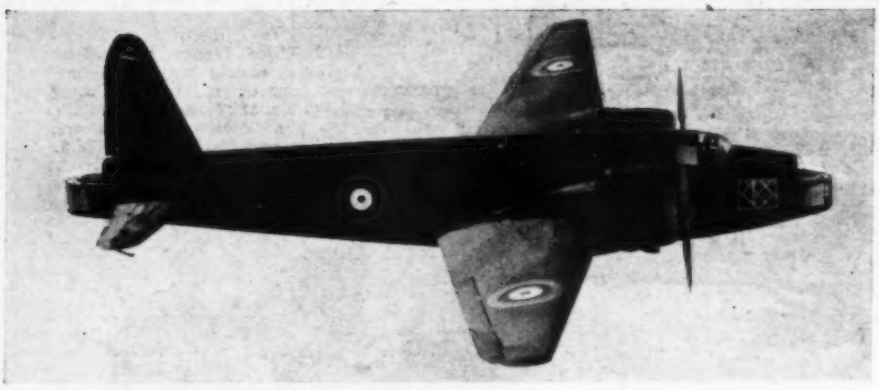
ARRANGEMENTS have just been completed for transferring the entire manufacture and marketing of the 50-h.p. Weir aero engine to Aero Engines, Ltd., of Kingswood, Bristol. G. and J. Weir, Ltd., are so busy on rotating-wing aircraft that they have not the time to develop the engine. It is to be hoped that Aero Engines will soon be in a position to announce that manufacture has started.

Hysterics and Hell Dives

WE would give a good deal to hear the comments of George Bulman on the film *Test Pilot*, now running at the Empire, Leicester Square. Gable, Loy and Tracy throw some plain and fancy hysterics, in and out of their cups, and Gable, as the seemingly incorrigible test pilot, is represented in the cockpit of a Seversky P-35, a Northrop A-17A, a Boeing B-17B four-engined bomber and what appears to be the Twin-Wasp-Junior-powered Keith Rider racer.

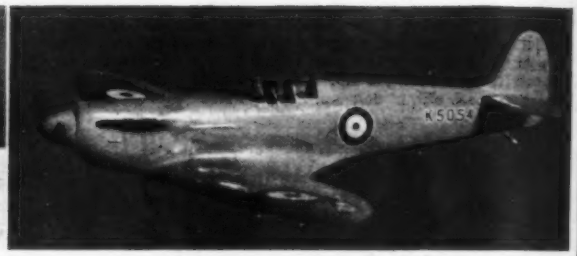
But whatever one's opinion of the histrionics (of which there is far too much), the flying shots (of which there are too few) are tip-top. A forced landing in the Seversky, "round the sticks" in the Keith Rider and spinning down from 30,000ft. in the Boeing, levelling out just in time to mow down a forest, are all presented with uncomfortable realism.

EXPANSION TYPES SOON TO BE IN SERVICE

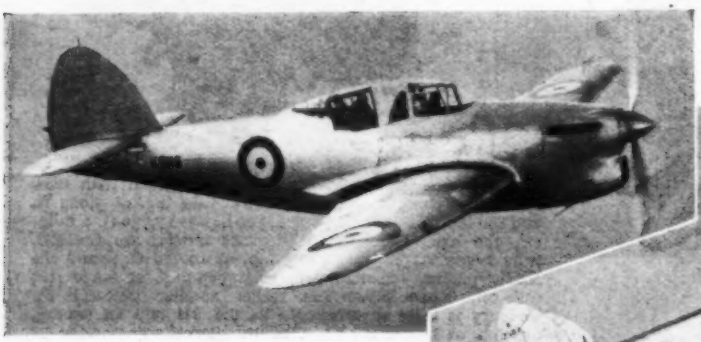


The much-discussed Vickers Wellington bomber with Pegasus engines is the second machine of geodetic construction to be adopted. The Rolls-Royce Merlin and Bristol two-row Hercules are alternative power units. Nose and tail turrets are installed.

A dive bomber fighter for Fleet work, the Blackburn Skua has folding wings. A Mercury or Perseus engine may be fitted.

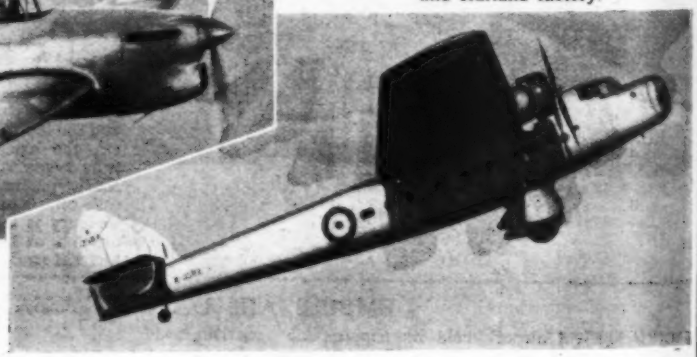


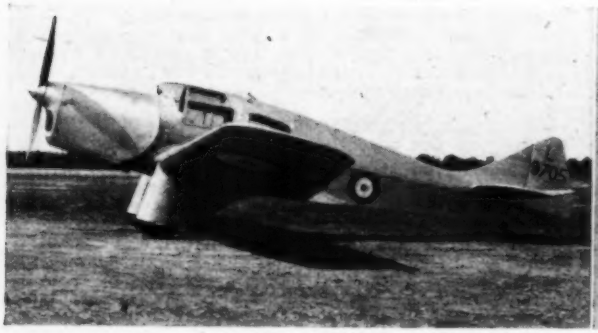
Probably the world's fastest fighter, the Supermarine Spitfire has a single Merlin engine. A special machine of this type is to make an attempt on the land plane speed record.



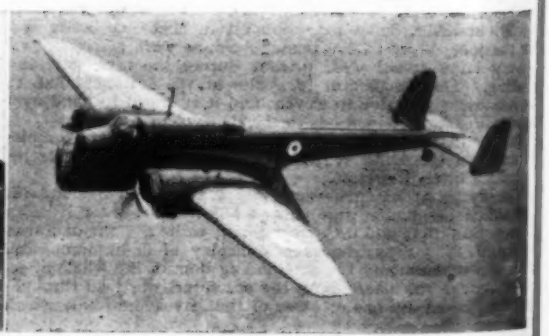
(Above)
Adopted for high-speed target towing, the Hawker Henley has a Rolls-Royce Merlin engine.

(Below)
The Bristol Bombay bomber transport (two Pegasus) is being made in the Short and Harland factory.





A training and communications type, the Miles Mentor has a 200 h.p. De Havilland Gipsyqueen engine.



The Handley Page Hampden (two Pegasus) will very soon be in service in considerable numbers. The nose of the production type will be more rounded than in the photograph.

FROM the CLUBS and SCHOOLS

CINQUE PORTS

BAD weather at Lympne throughout the week reduced flying hours to the low total of thirty-six, but many celebrities visited the club.

HAMPSHIRE

Three enthusiastic members have started their "A" licence courses and flying for last week made a total of 53 hr. 40 min.

BORDER

Strong winds curtailed flying considerably during last week and only 56 hr. 50 min. were flown. The Fox Moth is back in circulation and arrangements for Empire Air Day are complete.

C.A.S.C.

The first heat of the landing competition has been flown off. The final of this competition will form an event on the Corps Open Day on June 12, when visitors are invited to enter the timed arrival competition. Members flew 10 hr. 40 min. in ideal weather.

NORTHAMPTONSHIRE

Sywell aerodrome will be open to the public on Empire Air Day, May 28, and facilities will be provided for an examination of R.A.F. training machines. It is expected that a squadron will give flying demonstrations.

REDHILL

Flying hours for the week ended May 21 amounted to 40 hr. 55 min., including a flight over Reigate during the A.R.P. blackout. Mrs. G. Brown visited the club, flying a Lockheed 12A. New members included Mr. L. R. Glegg and G. E. D. Spratt.

YORKSHIRE

The flying total for the month of May had reached 161 hours on the 20th and during this week the club is busy on a large Army co-operation contract. It is hoped that an excellent show will be put up on Empire Air Day at Yeadon.

BARTON (BEDS)

During last week Mr. G. Perkins made his first solo. Among the events for the next two months are a Dawn Patrol on June 12, a supper dance on July 2 and a gala day for the King's Cup on the same date, when Barton will be a turning point. There will, of course, be a flying display next Saturday, Empire Air Day.

BENGAL

The club's flying total for April was a little below average because high and bumpy winds caused work to be practically suspended during the latter part of the month. Mr. K. R. Das passed all the tests for his "A" licence and Mr. P. R. M. Barrington is requalifying.

READING

The time for the car arrival competition on June 5 has been changed; this will now be between 4.30 and 5.30 p.m., and the flying demonstrations will be held between 5.30 and 7 p.m. A member who is flying to South Africa in her Sparrow-Hawk, Miss Joan Parsons, has reached Cairo and appears to be enjoying her trip. Eight new members joined the club.

SOUTHEND

During last week the Southend Club's hours for dual instruction totalled 25 out of a total of nearly 50, and on Sunday first solos were made by Messrs. Baker, Fingland and Try; Mr. H. M. Coombs had already made his first solo on Friday. On Empire Air Day the R.A.F. from North Weald are giving an aerobatic display and there will also be a demonstration by machines from Hornchurch.

BOURNEMOUTH

All the available club machines flew to the R.Ae.S. Garden Party on May 8, changing crews for the return journey with other members who had travelled to Harmondsworth by road. Mr. Gwynne Johns, the parachutist, has made his first solo, and during the last fortnight 44 hours have been put in by the club. Needless to say, preparations are being made for the aerodrome's biggest flying display on Saturday.

BROOKLANDS

A general flying competition was held last Sunday in order to select the team which is to represent the Brooklands Flying Club in the four-club competition on June 19. The winner was Mr. Anthony Spooner, with Mr. C. A. Nepean Bishop as runner-up. The competition was run on handicap lines as usual. Miss J. Kelly obtained her "A" licence and the flying times for the week were just under the 100 mark. Mr. K. Waller is to give an aerobatic display next Sunday.

HERTS AND ESSEX

Although the recent rain has hampered flying the surface of the aerodrome has been considerably improved thereby. Actually, the total for the fortnight ended May 19 was 153 hr. 35 min. Mr. L. H. Drake made his first solo, Mr. F. Murfet completed his "A" tests and six new members joined the club. Messrs. R. C. Sankey and P. E. Hindmarsh made a return trip to Paris in the club's Swallow. On Sunday the forced landing competition for the "Janet Lady Brickwood Cup" was won by Mr. M. O'Donovan, with 148½ marks out of a possible 150. The runners-up were Messrs. R. Sankey and F. Morat, with 148 and 147 marks respectively.

HANWORTH

The London Air Park Flying Club put in 121 hr. 45 min. last week. During the period three new members joined, Mr. N. W. F. Moore carried out his "A" licence tests, and Mr. Woodward, of the Midland Bank Club, made his first solo. Messrs. Jude and Hockey are taking night flying courses and Mr. Frizzoni, a Swiss subject, has returned to renew his British "A."

NORFOLK AND NORWICH

For some time the Norfolk and Norwich Club has been exploring the possibility of reducing flying costs and three ultra-light machines have recently been demonstrated at Mousehold. These were a Drone brought by Mr. Dimock from Ely, a Silver Cub brought by Mr. Elwell, and a two-seater Tipsy flown by Mr. Wesson. Mr. J. Dent has recently made a first solo, and last Saturday the club received a party of about fifty-five boys and two masters from a Great Yarmouth school.

The King's Cup Course

THE fifty-mile circuit for the King's Cup Air race, which will be held on Saturday, July 2, has now been selected by the Royal Aero Club. The start will, of course, be at Hatfield Aerodrome, and the two turning points will be at Buntingford, Herts, and Barton Airport, Beds. Twenty laps of the circuit will be flown to make a total distance of 1,000 miles, and the start will be at 9 a.m.

The £2,000 prize money presented by Viscount Wakefield has been allocated as follows:—First, £800; second, £400; third, £200; fourth, £100; and fifth, £50. Additionally there will be a special prize of £300 for the fastest time, and the remaining £150 will be spent on souvenirs for all pilots completing the course.

Competitors are reminded that entries close next Saturday, though late entries at double fees may be taken until June 4.

The Isle of Man Entries

ALTHOUGH entries for British-built machines may still be accepted—until May 30—the list for the Isle of Man Air Races, given below, may be considered as being virtually complete.

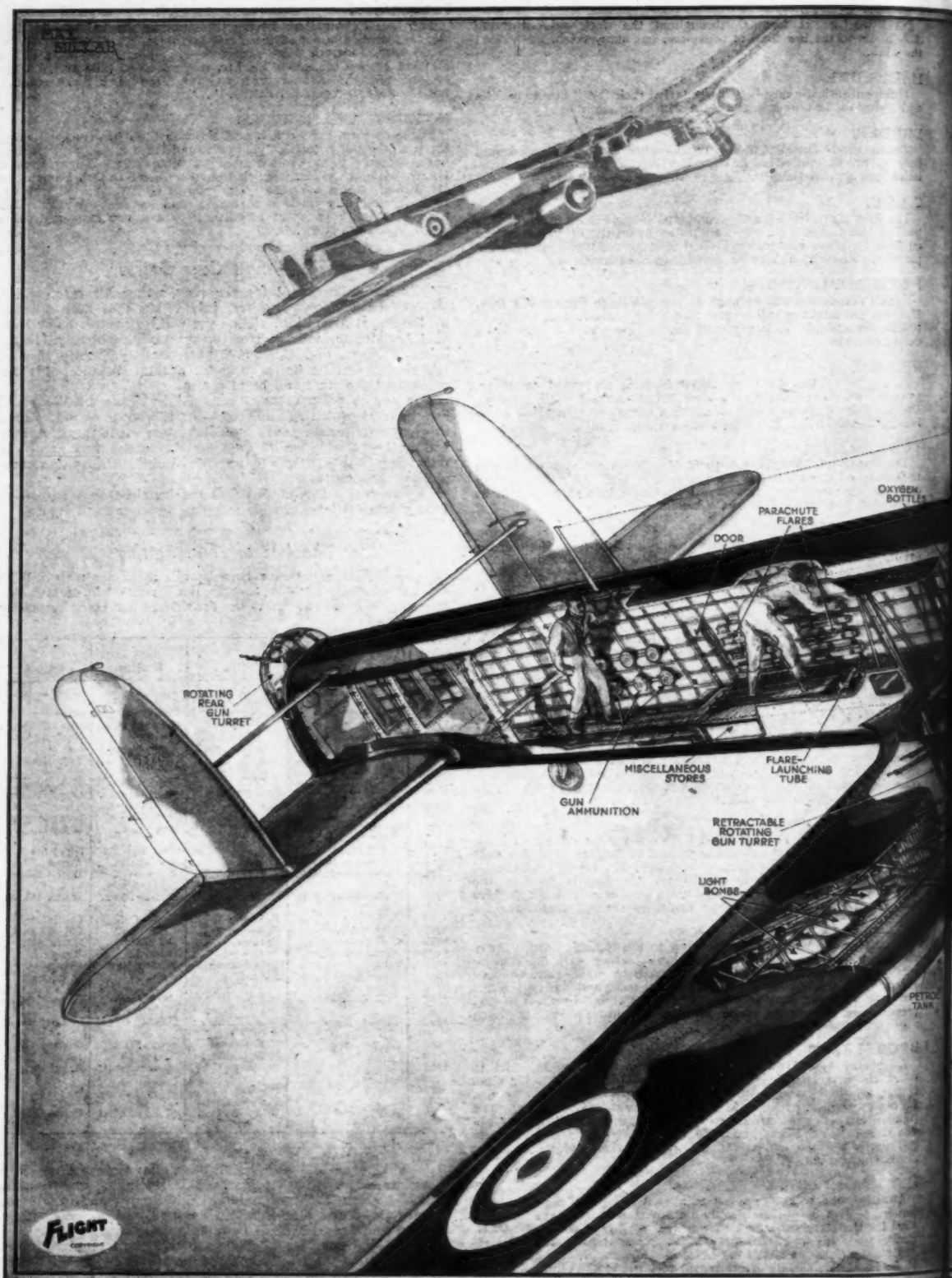
Racing No.	Entrant.	Pilot.	Machine.	Engine.
*† 1	Viscount Wakefield	F/O G. R. de Havilland.	T.K.2... ...	Gipsy Major.
*† 2	Giles Guthrie ..	Entrant ..	Mew Gull ...	Gipsy Six.
*† 3	W. Humble ..	,, ..	Sparrowhawk .	Gipsy Major.
*† 4	S. T. Lowe ..	,, ..	Comper ...	Gipsy Major.
*‡ 5	C. H. Tutt ..	,, ..	Comper Swift	Pobjoy.
*† 6	Major Hans Seidemann.	,, ..	AGO 6 ...	Argus 10c.
*† 7	Mrs. R. H. Dent ..	I. Rush ..	Hawker Tomtit	Mongoose II.
* 8	B. Brady	Tommy Rose ..	Hendy Heck...	Gipsy Six.
*† 9	F/O A. E. Clouston	Entrant ..	B. A. Eagle ...	Gipsy Six.
†10	H. Buckingham ...	,, ..	D.H. Dragonfly	Gipsy Major.
‡11	Misses Sheila and Mabel Glass.	,, ..	Gipsy Moth ...	Gipsy II.
*†12	A. Henshaw ..	,, ..	Mew Gull ...	Gipsy Six R.
‡13	F. Dawson Paul ...	,, ..	Dart Kitten ...	Aeronca Jap.
‡14	Czecho-Slovak Aero Club.	J. J. Novak ..	Benes and Mraz Beta Minor.	Walter Minor.
*‡15	Czecho-Slovak Aero Club.	Dr. V. Miklenda	Bibi-Be 550 ..	Walter Mikron.
‡16	A. J. Walter ..	P. B. Elwell ...	Taylor Cub ..	Continental.
*‡17	Janis Vitols ...	P. Avery ..	V.E.F. J.12 .	Cirrus Minor.
*‡18	C. G. M. Alington...	Entrant ..	Desoutter ..	Cirrus Hermes.
*†19	Antoine Gazda ...	,, ..	Fairchild ...	Ranger.
*†20	Capt. J. Pooley ...	John Kirwan ..	Stinson Junior	Lycoming.
*‡21	F/Lieut. H. R. A. Edwards.	Entrant ..	Avian IV ...	Hermes II.
*†22	J. M. Barwick ..	,, ..	Miles Hawk Trainer.	Gipsy Major.
*‡23	Lt.-Col. Joseph Kalla.	,, ..	B.E.51 ...	Walter Minor.
†24	German Aero Club	E. Gerbrecht ..	Focke-Wulf ...	Siemens 14a.
*‡25	,, ,,	F.W. Clausen..	Klemm 35 ...	Hirth H.M. 504.
*†26	,, ,,	Pasquay ..	Messerschmitt M.E.108.	Argus 10c.
†27	,, ,,	Roeders ..	,, ,,	,,
†28	,, ,,	Wohlenhein ..	,, ,,	,,
*‡29	A. R. Ward ...	R. L. Porteous	Chilton D.W.1	Carden Ford.

* London-Isle of Man race. † Manx Air Derby. ‡ Tynwald Air race.

It will be noticed that the list includes six machines from Germany, three from Czecho-Slovakia (including one from the Czech Air Attaché in London, Lt. Col. Joseph Kalla), one from Latvia and one from Switzerland. Gen. Wenninger, the German Air Attaché in London, will be flying over.

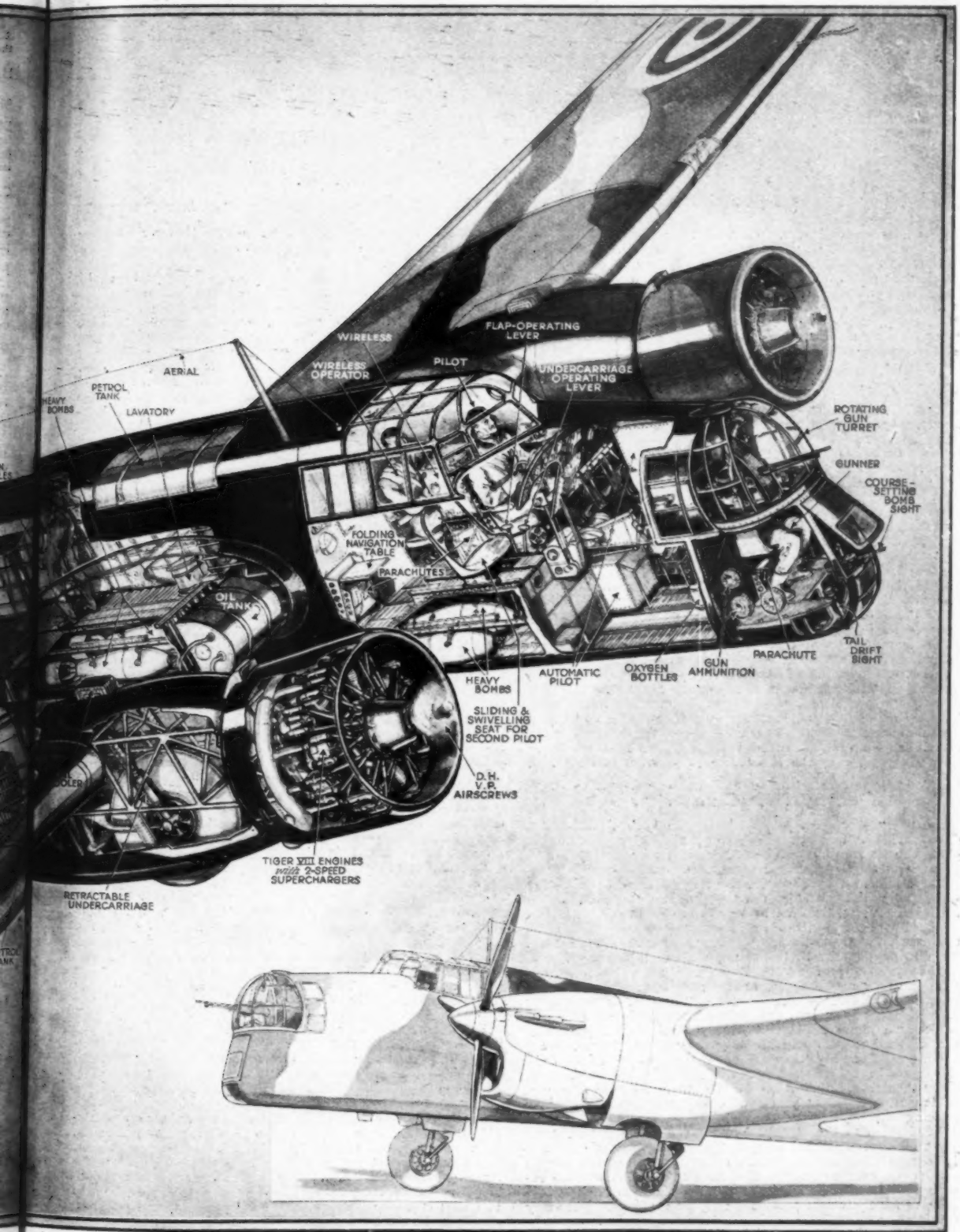
The Island course is the same as that for last year's races. In addition to the trophies which have been presented by Mr. W. Cunningham and by Germ Lubricants, Capt. G. Olley has also presented a cup for the Tynwald race. During the afternoon of June 6 Herr Kronfeld will be giving a soaring exhibition, and Herr Zollinger will give an aerobatic display.

A LONG-RANGE BOMBER NOW in SERVIC-The



A specially prepared *Flight* drawing of the Tiger-engined Whitley bomber, a type used by several squadrons of the Royal Air Force. The speed is well hand corner shows the nose of the latest type of Whitley—the Mark IV—ordered for service with Rolls-Royce engines. It wi

The ARMSTRONG WHITWORTH WHITLEY



Tweed is well over 200 m.p.h. with an impressive bomb load, the precise weight of which is undisclosed. The inset in the bottom right-ines. It will be noted that ejector-type exhaust manifolds, which are very beneficial to performance, are incorporated.

JOINING THE ROYAL AIR FORCE

An Outline of the Opportunities Offered for Officers and Airmen in the Regular Air Force, Reserve, Volunteer Reserve and Auxiliary Air Force

SINCE expansion began, facilities for making the Royal Air Force a career, either by a commission or in the ranks, have been extended. There are so many branches of the Service, and so many methods of entry, that the young man who is interested in the idea is often pardonably confused as to his best line of approach.

One thing, of course, is certain: That the life offers the right type of young man all he can desire in the way of interest, healthy, open-air life and, in many cases, world travel. Moreover, he may receive free of all charge (and, indeed, be paid extra for) flying instruction which would be far beyond his means in civilian life.

Those seeking a permanent commission in the General Duties Branch enter either through the Royal Air Force College, Cranwell (age limit for entry 17½-19½), or from a recognised university (20-25). The officer qualifies for retired pay on completion of a minimum period of service of twenty years. For the General Duties Branch a high standard of physical fitness and general intelligence is required.

Permanent commissions are also obtainable in the six specialist branches of the R.A.F.—Equipment, Accountant, Medical, Dental, Legal and Chaplains. For these branches the physical requirements are not so stringent, and officers are not called upon to qualify as pilots, though flying as passengers may at times be necessary. A high standard of capability in the particular direction concerned is, of course, insisted upon. Space does not permit the recital of entry details for each of these classes, but, briefly, it may be said that acceptance is either by competitive examination to fill vacancies, or by graduation from a short-service commission.

A larger proportion of Royal Air Force officers enter the General Duties Branch with short-service commissions, which give them a period of four years' service, usually followed by transfer to the Reserve, though in certain selected cases they may be awarded permanent commissions. Candidates for s.s. commissions must be between 17¾ and 25, and undertake to serve six years with the Reserve on completion of their four years.

Short-Service Commissions

Short-service officers join with the rank of Acting Pilot Officer, and pay and promotion after the initial year's training place them on exactly the same terms as regards pay and authority as officers holding permanent commissions.

There is also a medium-service commission; on completing three years, the S.S. officer may apply for retention for a further five years, followed by four in the Reserve.

The Royal Air Force Reserve is, as its name implies, an organisation of trained officers and men which could be called upon to supplement the regular Air Force in an emergency. It consists mainly of personnel who have served their periods with the regular Air Force, but there is a rapidly expanding branch—"Class A"—which takes entrants direct from civil life. Candidates (18-25, unmarried) accepted for commissions as Reserve pilots undergo a two months' elementary flying course at approved civil schools, retaining civilian status. On passing satisfactorily, they are given the rank of Acting Pilot Officer on Probation, and spend a year in full-time training. They then revert to civil life for the remainder of their period in the Reserve—four years, with a short annual period of training in each.

Next there is the R.A.F. Volunteer Reserve, which is so operated that personnel receive their training in their spare time from civilian occupations, an annual fifteen days being the longest continuous period. As a rule, volunteers are expected to attend their flying training schools on alternate weekends, or for equivalent periods during the evenings. The entry age is 18-25.

Special sections of the Volunteer Reserve are also open for the training of Equipment Officers (25-40) and Medical Officers. Needless to say, the Reserve and Volunteer Reserve schools offer the keen young man a fine opportunity for free flying tuition, with uniform allowances and retaining fees, and full pay during the annual training period.

There remains the Auxiliary Air Force, a Territorial organisation administered by County Associations. Personnel are mainly volunteers, though in each of the sixteen squadrons there is a nucleus of Regular officers and airmen. Service in an A.A.F. unit is, normally, a spare-time occupation. There is pay during the annual training period and, in the case of commissioned ranks, pay during periodical flying training. Candidates for A.A.F. commissions must be between 18 and (in most cases) 30, and the minimum initial period of service is five years. Officers who have completed their original engagements may transfer to the A.A.F. Reserve of Officers.

As the University Squadrons are in a somewhat specialised class we do not intend to deal with them here; intending entrants can easily obtain details through their university authorities.

Application for entry forms for the various sections dealt with above are obtainable from The Secretary, The Air Ministry, Kingsway, London, W.C.2. Information is also obtainable at the local H.Q. of the A.A.F. Squadrons.

Other Ranks

Turning now to the ranks, personnel for the Royal Air Force are chiefly recruited by two methods: the direct entry of skilled and unskilled men from civil life, and the entry of apprentices who have undergone special courses of training in the various schools of the R.A.F. into which they have passed direct from their own schools.

Direct entrants are, mainly, divided into those who are skilled or semi-skilled in some trade (which term includes sedentary occupations such as that of clerk) used by the R.A.F., and those altogether unskilled.

Tradesmen or aircrafthands in the majority of categories are eligible for flying training on qualifying in their particular trade. An airman qualifying as a pilot is promoted to the rank of sergeant, while a certain number of permanent commissions are granted to airman-pilots of exceptional efficiency.

Of particular interest is a scheme, put into effect since the expansion, by which those who, for various reasons, cannot qualify for short-service commissions, make direct entry as airman-pilots. Thus suitable young men of secondary school education, 17¾-25 years of age, are accepted for immediate flight training.

Those interested in this method of entry should apply to The Secretary, The Air Ministry, Gwydyr House, Whitehall, London, S.W.2. Information on joining the ranks is obtainable at any of the following R.A.F. recruiting offices:—

London.—Victoria House, Kingsway, W.C.2.
Liverpool.—79, Lime Street.
Manchester.—11, Peter Street, Deansgate.
Glasgow.—10, Bothwell Street.
Newcastle-on-Tyne.—153, Pilgrim Street.
Birmingham.—55, Cornwall Street, 3.
Bristol.—91, Victoria Street.
Cardiff.—Dominion House, Queen Street.
Leeds.—7, Cabinet Chambers, Basinghall Street.
Plymouth.—12, Buckland Terrace, Millbay Road.
Belfast.—46, Ann Street

Leaflets giving details of the various requirements are obtainable from these depots or, in the case of commissioned ranks, from the Secretary of the Air Ministry. The whole subject, incidentally, is set out admirably in a book, *The Royal Air Force—Careers and How to Join*, by T. Stanhope Sprigg, published at 5s. by Pitmans. The very complete details, both as to initial requirements and as to pay, prospects and pensions, should make the book particularly valuable to the young man who wants to make comparisons in order to learn for which branch of the Service he will best be fitted, either as officer or airman. A new edition is now on sale.

OVER the OUTPOSTS

The Manifold Duties of the Royal Air Force Abroad — and Some Lighter Reminiscences

By NAVIATOR

Vickers Valentia bomber-transports (two Pegasus) over Cairo. Though of somewhat antiquated type, the Valentia is still doing yeoman service out East.

OF a pilot with Overseas service a sere skin and a becoming reticence are expected. The latter is often ascribed to native modesty, but it may well derive from having little or nothing to say about the tedious monotony of "police" and patrol duties over vast tracks of desert, endless ranges of stark mountains, or the wastes of the sea. There is not much to relate about a three-hour routine flight in the Peshawar district. The romantic sea palls after a week. The high efficiency of bomber and co-operation aircraft of to-day are partly to blame for lack of incident in thousands of patrol flights which are carried out year after year, for watch is constantly kept from the air.

Much of the R.A.F. patrol work passes completely unnoticed and unrecorded save for bare entries in log books. Flipping back the pages that tell of a thousand hours' flying, many of the flights logged are meaningless even to the pilot—just routine journeys in space. That these flights checked some errant local from subversive activities cannot be logged: their purport is now as dissipated as the engine echoes that made tremble some fakir, bandit, pirate or political fanatic.

Patrol under active service conditions is to-day chiefly operated in the North-West Frontier and unsettled Arabian districts. In the majority of cases air operations in these places are necessary against restless tribes which have been stirred to cause trouble by religious and political fanatics or want of food. Hardy hillmen regard the plainsmen as legitimate prey whose comparatively fat farmlands will replenish their food stores—usually a seasonal need. Motives behind political and religious unrest are obscure, but their roots lie bedded in the promise of food or pastures to come. To use aircraft against such primitive troubles seems far-fetched, yet it is by far the least costly and most effective of all military measures and is now a recognised procedure.

Various methods can be employed to quell tribesmen whose shooting prowess is so phenomenal that it renders low flights really hazardous. Eight hundred yards is a deadly range for hill marksmen. They cherish good weapons, often of the latest pattern. Patrol by air must therefore be conducted warily. Wise tribesmen move only by night, and are exceedingly difficult to locate. It is these nomad tribes' activities which find their way into the newspaper headlines. Recalcitrant villagers who refuse to pay their taxes are soon subdued.

Procedure has its local adaptations, often governed by the report of the district British agent. In every case a warning is first given: dropped leaflets and a loud-speaker trailing far below the aircraft are two methods likely to impress natives. The latter method has its drawbacks. It is necessary to employ a native conversant with local dialect to make the broadcast. One sportsman pressed into service for this job spent his entire time praying to return safely to terra firma. Another occupied the entire flight haranguing and abusing relatives below.

Following the warning—which, experience soon teaches, should not go unheeded—operations may be intensified. The object at this stage is to harass the normal lives of the community. This is achieved by continuously interrupting the daily work on the grazing grounds, in the farm fields, and in the village. Though bombs may not actually be dropped the drone of an approaching aeroplane is the signal for a sprint to cover—very hot, very undignified, very nuisance-making.

Trusting the Engine

To forced-land in country such as the N.W.F. is to crash. Terraces of sparsely cultivated land traverse the hills (*anglice:* mountains). A dried-up stream in summer or a raging flood in winter is found down each valley. Tiny communities somehow exist on these vast ranges of rock. To have a crash in such country is to place your fate on the knees of the gods. Swarthy gentlemen with piercing eyes will debate your ransom value. Your watch and glittering buttons will be immediately forfeit, though nowadays most tribesmen realise the cash or in-kind value of a "returned-to-store-undamaged" pilot. Savage hostility lies only in the passionate breasts of fanatics against whom war operations have been undertaken. At the hands of the fakirs cases of mild torture are not unknown.

Redheads are venerated in many primitive districts. There is a case of an officer being held in close confinement whilst his observer corporal, a man with a mop of red hair, threw a party with the tribesmen.

Most keen young pilots, on first posting to India or the Near East, determine to learn the local lingo in case of trouble in the future. They may well learn a lesson from the pilot who swotted Urdu (or Pushtu) and who one day forced-landed between Kohat and Risalpur. A native helped him, dazed, from the cockpit. The pilot attempted a few phrases in Urdu (or was it Pushtu?) and received a reply in Pushtu (or Urdu). *Impasse!* Signs were equally unavailing. Finally, after ten minutes exploratory conversation the native queried brightly: "Parlez-vous?" Dumbfounded, the officer racked his memory for phrases

of schoolday French and managed to win through. The native had served in Flanders and well knew café *patois*, though he was entirely ignorant of local languages.

Even more remarkable is the case of the officer who, not so long ago, forced-landed on patrol at an unidentified place in the south Sudan, a place which he declares to be unmapped. To his astonishment a distinguished looking white man appeared with a crowd of natives. This elegant gentleman wore the uniform of a French army captain (and such was, in fact, his rank and position). In no time he invited the R.A.F. pilot to the local "hotel" which, he said, he now owned. It *was* a hotel of the Eastern type, though not in a month of Sundays did any guest arrive. Chief feature of this establishment was a billiard table, and the two officers were soon engaged in a game of snooker. All through the hot night they played. In the small hours the gallant *capitaine* explained he was "left over" from the war—one of the hundred lost soldiers France boasts. Forgotten at his war-time post, he lay doggo. Each month his salary was paid into his Paris bank. Once a year he visited Cairo. For the rest he passed his days in the Sudan hinterland.

Came the dawn . . . and with it a bill for ten hours' snooker at five shillings an hour!

Though often more monotonous, even, than patrol over the land is work at sea. It is seldom so dramatic as it was in the case of H.M.S. *Eagle* homeward-bound from South America in June, 1929. Message came through that a Spanish flying boat was down in the sea. The British aircraft carrier sent out a band of pilots, seeking in vain a drop in the ocean. Two days, three days, four days passed: and then the seemingly fruitless search was abandoned. Yet on the seventh day, at a fix some 400 miles from the original position given, Major Franco was found in his aircraft in the sea and duly rescued by the *Eagle*.

In home waters patrols extend the length of the coast. From bases at Calshot, Gosport and Mount Batten routine exercises for the discovery of presumed forces of an approaching Armada nature are carried out. Since these forces exist only in the imagination, peace-time patrol is dull if necessary training work.

There is the good story (possibly apocryphal, but none the worse for that) of the civilian enthusiast who used to operate a Moth from the Isle of Wight. For the Service pilot, concentrating on some navigation problem in a slow (and now hopelessly obsolete) type of flying boat or seaplane it was most infuriating to find this Moth pilot practising formation flying and, worse still, using the Service aircraft as a dummy target for what he imagined to be air combat tactics. This human blister aroused comment in the mess, and one day a message was telephoned to a fighter flight at Gosport that the Moth was on the wing.

At once two Flycatchers headed for the Isle of Wight, located the cause of the trouble, and formated on *him* for a change. Now, the Flycatcher was (and still would be to-day) one of the best of formation aircraft. Literally, a gap of a few inches separated the extremities of the Moth's wings from the formating Flycatchers. In his cockpit the public nuisance paled, but had to sit tight. He noticed he was heading for France, and signalled a turn. He banked gingerly, but hastily corrected the manœuvre as the tiny gap closed. He dived, he climbed, but he dare not turn. Finally, some twenty miles out to sea the Flycatchers drew away and the Moth made a bee-line for home. At least, he meant to: but two Flycatchers that seemed like twenty made ubiquitous movements around him, above, below, and before.

At last the Moth was allowed to land safely at Ryde; and for ever after the Service pilots were allowed to work in peace, unhampered by any amateur war-bird.

Turning back the log-book pages to late war days only a few remember the patrol at Medvejagora, not far from the White Sea. The Russians were known to have two aircraft, but the patrol could never find them. In the end a spy revealed that the two enemy aircraft never did fly—the pilots used the petrol in a concoction which they drank on cold nights!

Rescue work in Hankow in the floods of 1931 to bring succour to cut off communities; pirate patrols at Amoy and Bias Bay; fire patrols over forests; the searching for missing airmen such as gallant Kingsford Smith—such duties as these fall to the lot of R.A.F. patrols, ceaselessly carried out for the good of the Empire in peace or in war.

Atlantic patrol: Fairey Swordfish torpedo-spotter reconnaissance biplanes over their mother ship, H.M.S. *Glorious*. A machine of the same type is just landing-on.

SERVICE AVIATION

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

New Aircraft

IT has become possible to refer to the performances attained by certain new military machines.

The Westland Lysander Army co-operation monoplane with Mercury XII moderately supercharged engine, flying at an all-up weight of 5,920 lb. (the empty weight is 4,065 lb.), has given the following results : Speed at sea level, 206 m.p.h. ; at 5,000ft., 220 m.p.h.; at 10,000ft., 229 m.p.h.; at 15,000ft., 223 m.p.h.; climb to 5,000ft., 3.1 min.; to 10,000, 6.8 min.; to 15,000, 11.4 min.; service ceiling, 26,000ft.; and range, 600 miles at 150 m.p.h. The stalling speed, due to the slots and flaps, is, of course, exceptionally low and the take-off remarkably short. Front and rear guns are specified and bombs may be carried in faired racks which look like stub wings. The production Lysanders have camouflage finish. The Perseus engine is specified for the Lysander II which will be delivered after the Mercury-powered machines have been despatched.

The top speed of the Fairey P.4/34 light bomber (1,050 h.p. Merlin) has been quoted as 283 m.p.h. at 15,000ft., though it is believed that even better results have been obtained. This machine should lend itself very well for development as a fighter.

The Hawker Henley, designed to the same specification and ordered in quantity, is now officially classed as a target-towing aircraft. Figures are not available, but speed quoted for the Fairey gives an indication of its potentialities.

Alternative engines to the Pegasus in the Vickers Wellington are Rolls-Royce Merlins or Bristol Hercules. Two-speed blowers are to be expected.

Announcement has just been made of the new Reid and Sigrist monoplane trainer, a private venture three-seater with two Gipsy Six engines, which should give a speed of over 200 m.p.h. The span is only 32ft. 6in. and the all-up weight about 5,000 lb. Details will be forthcoming shortly.

New R.A.F.V.R. Centres

ARRANGEMENTS have been completed for the entry of personnel for training as pilots at three new R.A.F.V.R. centres, at Grimsby, Nottingham and Oxford. This brings the total of such centres to twenty-five.

Coventry R.A.F.V.R.

WELL over 500 people attended the dance at the Drill Hall, Coventry, on Friday, May 13, to celebrate the official opening of Keresley Grange, the new Town Centre of the R.A.F. Volunteer Reserve at Coventry.

Transfers to Middle East Command

NO. 80 Squadron (Gladiators) and Nos. 113 and 211 Squadrons (Hinds) have arrived in Egypt to supplement the eight squadrons of the Middle East Command. The appearance of Blenheims and Wellesleys in the Middle East may be taken as an indication of further re-equipment.

Renaissance in New Zealand

MR. JONES, the Minister for Defence for New Zealand, has announced that the expenditure on civil and military aviation last year was £567,000. In his policy speech he stated that the Government had established the Air Force as a separate service, approved the formation of two new operational stations, established a training school for pilots and approved the establishment of a repair and storage depot.

Five Airspeed Oxfords have been ordered for training and survey work and the operational squadrons will be armed with thirty Vickers Wellington (happy name!) bombers.

Approval for the formation of four Territorial squadrons has been given and twenty-nine Blackburn Baffins have been acquired at very low cost from Air Ministry reserves.

New Zealanders are being accepted for Short Services Commissions in the R.A.F.

The permanent New Zealand Air Force personnel will be raised to 900 by 1940.

"*Flight*" *photograph.*

The Airspeed Oxford twin-engined trainer demonstrates its agility at Martlesham.

Gift of a Bomber

THE president of the Bank of New South Wales has given £10,500 to the Commonwealth Government "for the purchase of a modern bomber," and in the hope that others will follow his example. The machine should be ready within two months.

At the Royal Tournament

ONE of the most satisfying items in the programme of the Royal Tournament, in progress at Olympia, London, until June 4, is the physical training display by 128 recruits of the Royal Air Force. The men, of an average age of 19 years and four months' service, demonstrate figure marching in double time, maze marching, and club-swinging. They give their display to the music of the Royal Air Force Band.

Flying Accident

THE Air Ministry regrets to announce that No. 561216 Cpl. Leonard Francis Stone and No. 565853 A/C.1 William John Ashton are missing and believed to have lost their lives as the result of a collision in the air which occurred at Seletar, Straits Settlements, on May 18, between two aircraft of No. 100 (T.B.) Sqn., Seletar. Cpl. Stone and A/C. Ashton were the members of the crew of one aircraft, the pilot of which, F/O. Frank Howard Roberts, was rescued. The occupants of the other aircraft were not injured.

Old Haltonian Continental Tour

IN view of the great success of last year's tour to Belgium, Germany and Austria it has been suggested that another tour for ex-Halton apprentices should be arranged this year. The tour will probably be during the first fortnight in August. It will be open to all ranks, but, except by special application, it will be limited to ex-apprentices and past and present members of the staff of one of the R.A.F. Schools of Technical Training. Anyone interested should communicate at once with Mr. A. C. Kermode, Purwell Mill House, Hitchin, Herts.

SERVICE AVIATION (CONTINUED)

FOREIGN SERVICE NEWS

Autogiros in the U.S. Army

SIX Kellet Autogiros of a new type have been delivered to Patterson Field for use in an "Autogiro transition flying training course." The machines are much more powerful than the Rotas used by the R.A.F. and are characterised by a very neatly faired pylon for the rotor blades.

The Bell for Service Trials

THIRTEEN examples of the Bell XFM-1 (Airacuda) twin-engined multi-seater fighter have been ordered for service trials by the U.S. Army Air Corps. The XFM-1 represents one of the most striking advances in the design of military aircraft for some time, having pusher propellers driven by liquid-cooled Allison engines with exhaust-driven superchargers. The noses of the engine nacelles take the form of compartments for gunners who are armed with shell guns manufactured by the American Armament Corporation. These can be trained over a limited arc and typify the semi-fixed armament now being advocated by one school of experts. Additional armament (there are six guns in all) takes the form of Browning machine guns mounted in "blisters" in the fuselage, reminiscent of those on the four-engined Boeing bombers. A small bomb load can be accommodated. The pilots' compartment seats two in tandem and there are dual controls. It is possible that production machines may have supercharged cabins.

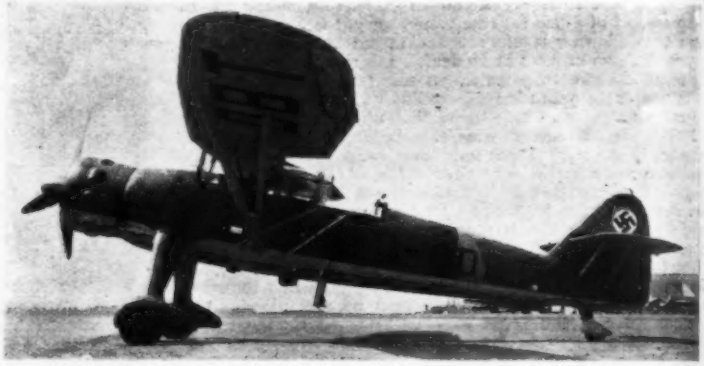
A small auxiliary power plant drives nine electric motors to supply power for the comprehensive radio equipment, lighting and heating, engine starters and the retraction of the main undercarriage, the tail wheel and the split flaps.

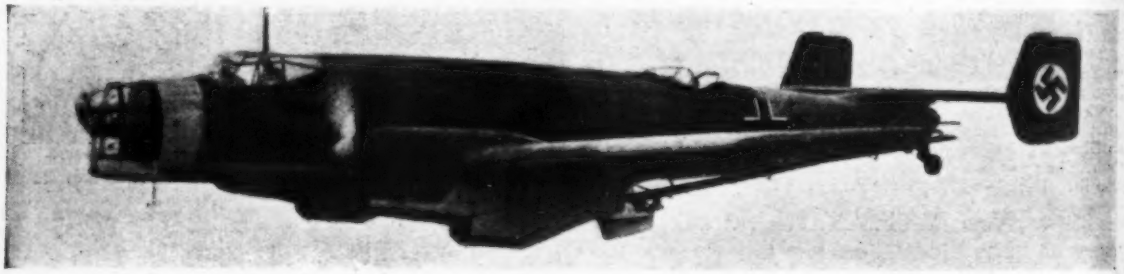
The airscrews are of the Curtiss full-feathering type with electric operation.

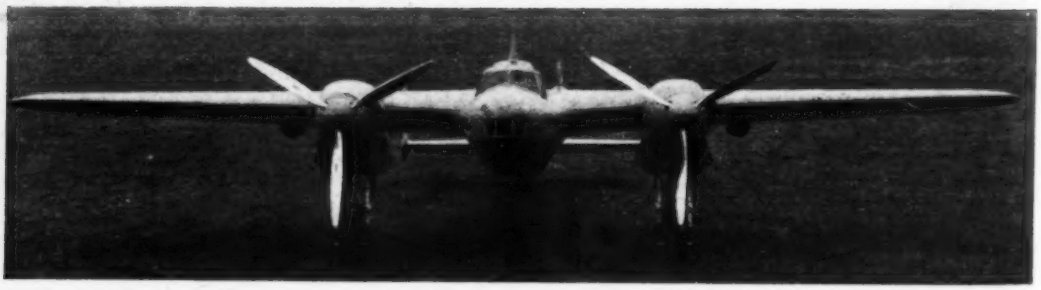
TEUTONIC TRIO

Representative Types of Germany's Air Force

The Henschel He. 126 (top) is a general-purpose machine particularly suitable for observation (army co-operation) work, due to its parasol layout. Below the Henschel is the Junkers Ju.86K bomber with twin Junkers Jumo engines. Machines of this type equip a number of German squadrons. The Dornier Do.17 bomber (bottom) has two Daimler Benz inverted vee engines and is capable of something like 280 m.p.h. Similar machines, with the older B.M.W. engines, have been in service with the German Air Force for a considerable time.







Forthcoming Events

May 26. Royal Aeronautical Society: Wilbur Wright Lecture: "Materials in Aircraft Construction," by Dr. H. J. Gough. Institution of Mechanical Engineers, 6.30 p.m.
May 28. Air League of the British Empire: Empire Air Day.
May 28-June 13. Belgrade Aero Show, Yugoslavia.
May 29. Opening of Aalborg Airport, Rödslet, Denmark.
June 4-6. Manx Air Races.
June 11. Bristol and Wessex Aeroplane Club: Garden Party.
June 18 and 19. Brooklands Four-club "At Home."
June 22-28. F.A.I. Conference, Berlin.
June 25. Official opening of Wolverhampton Airport.
June 25. Air Display, Gatwick Airport.
June 25-July 1. Magyar Pilota Picnic, Budapest.
June 30. Aero Golfing Society: Jubilee Cup, Prince's, Sandwich.
July 2. R.Ae.C.: King's Cup Race.
July 9. Ipswich Aero Club: Flying Meeting.
July 9-17. National Gliding Contests, Dunstable.
July 16-18. Deauville Rally.
July 16. Official opening of Luton Municipal Aerodrome by Secretary of State for Air.
July 17-24. Third Littorio Rally, Italy.
July 23. County Flying Club: Flying Meeting at Rearsby, Leicester.
July 29-August 1. Courtrai Rally, Belgium.

EMPIRE AIR DAY

A Guide to Next Saturday's Displays Throughout the Country

NEXT Saturday, May 28, is Empire Air Day, when some sixty Royal Air Force Stations and nearly thirty civil aerodromes will be opened to the public.

The flying displays which have been arranged are not by any means the whole story; at almost every Service station visitors will be able to see the Royal Air Force "at home" and to inspect its equipment at close quarters.

Below will be found a condensed guide to the programmes at each of the stations, indicating some of the more outstanding items.

At all aerodromes the admission charge is 1s. for adults and 3d. for children under 15, and proceeds go to Service charities. Cars may be parked for 6d. at some stations and 1s. at others. Displays will last from 2 p.m. until approximately 7 p.m.

An innovation this year will be tours by large formations of Service aircraft which will give brief displays at each aerodrome visited.

"Squadron flat spin in echelon — go!" (Members of the public are to be allowed to give orders to aircraft by radio on Empire Air Day)

LONDON AND HOME COUNTIES

Group 1

ESSEX

Debden, Saffron Walden (3 Fighter Sqns.).—Radio orders by visitors. Air raid. Tied aerobatics. Forced landing and rescue from Arabs. Bombing.

Hornchurch, Romford (3 Fighter Sqns.).—Raid. Bombing. Air drill. "Pupil and instructor." Message picking-up. Flying boat. Passenger flights.

North Weald, Epping (2 Fighter Sqns.).—Raid. Air drill by R/T. Exhibit from balloon barrage. Civil flights.

Rochford, Southend (Civil).—R.A.F. co-operation. Individual acrobatics by Gauntlet. Civil display.

HERTS

Hatfield (Civil).—Service training centre. R.A.F. co-operation. Raid. Flying boat. Civil display.

KENT

Biggin Hill, Bromley (2 Fighter Sqns.).—Raid. Altitude race. Quick get-away. R/T. drill. Drogue firing. Message and supply. Comic events.

Gravesend (Civil).—Service training centre. R.A.F. co-operation. Raid and events by No. 14 Fighter Squadron. Civil display.

Eastchurch (Armament Training Station).—Gas displays. Air combat. Aeroplane v. armoured car. Bombing. Supply dropping. Drogue firing. Fly-past.

Lympne, Hythe (2 Bomber Sqns.).—Raid. Passenger flights to watch live parachute drop. R/T. orders by public. Air fight.

Manston, Margate (1 A.A.F. Bomber and 1 Reconn. Sqn.).—Raid. Gas displays. Air combat. Dive bombing. Massed flight. Civil flights. Schools of technical training and air navigation.

MIDDLESEX

Hendon, N.W.9 (3 A.A.F. Fighter and 1 Cmn. Sqn.).—Interception of bombers. Raid defence. Dive bombing. R/T. orders by visitors. Air drill. Flying boat. "Pupil and instructor." Message picking-up. Fly-past.

Northolt, Ruislip (2 Fighter Sqns.).—Raid. A.R.P. Flights in fly-past for visitors. High-speed flying. Parachute.

Hanworth, Feltham (Civil).—Service training centre. R.A.F. co-operation. Aerobatics. Bomb raid. Low bombing by Battles. Parachute. Dive bombing. Fly-past. Civil display.

Heston, Hounslow (Civil).—Service training centre. R.A.F. co-operation. Aerobatics. Crazy flying. High-speed flying. Civil display.

SURREY

Kenley, Whyteleafe (2 Fighter, 1 Army Co-op. Sqn.).—Attack on A.A. gun. R/T. air drill. "Pupil and instructor." Message picking-up. Civil flights. Machine-gun practice against stop butts.

Brooklands (Civil).—"Old-timers" (Bleriot, Farman, Fokker, Sopwith) exhibited and flown (weather permitting). Civil display.

Group 2

BEDFORDSHIRE

***Cardington,** Bedford (Balloon Barrage training unit).—Barrage. Dive bombing. Height- and speed-judging competitions. Air race. Physical training display.

Henlow, Hitchin (Home Aircraft Depot, School of Engineering, etc).—Queen Bee. Bomb attack on convoy. Live drops. Relay and air races. Workshops.

Dunstable Downs (Civil).—Gliding exhibition (weather permitting).

BERKSHIRE

***Abingdon** (2 Bomber Sqns.).—Dive bombing. R/T. drill. Message picking-up. Fly-past. Civil flights.

Reading, Woodley (Civil).—Service training centre. Individual aerobatics by visiting R.A.F. aircraft. Civil display.

BUCKINGHAMSHIRE

Cranfield, Woburn Sands (2 Bomber Sqns.).—Dive and low bombing. A.R.P. Attack on tank. R/T. drill. Message picking-up. Civil flights.

Halton, Wendover (School of Technical Training, etc.).—Bombing training. Parachute dropping. Air drill. Physical training and massed bands displays. Air raid. R.A.F. hospital and medical training centres.

CAMBRIDGESHIRE

Duxford, Cambridge (2 Fighter Sqns.).—Forced landings. "Follow-my-leader" in the sky. Glider towing. Air defence. R/T drill. Parachute dropping.

Caxton Gibbet (Civil).—Gliding exhibition (weather permitting).

HUNTINGDONSHIRE

Wyton, Huntingdon N. (2 Bomber Sqns.).—Bombing. Air defence. Parachute dropping. Drogue firing. Civil flights. Glider towing. Fairey Battle on view.

HAMPSHIRE

South Farnborough (3 Army Co-operation Sqns., R.A.E., etc.).—Rota (Autogiro) flying. Air raid. Dive bombing. High-speed flying. Exhibits by School of Photography and Royal Aircraft Establishment.

Odiham, Hook (3 Army Co-operation Sqns.).—Bombing a town. Attacks on targets. Message and supply in formation. Massed drum and pipe bands.

Andover (Staff College and 2 Bomber Sqns.).—Attack on set-piece. Message and supply. Dive bombing. Parachute dropping. Supply dropping. High flying and camera obscura exhibits. Civil flights.

Calshot, Southampton West (Reconn. Flying Boat Sqn.).—Launching of flying boats. Marine aircraft in flying display. R/T. drill. Torpedo dropping. Making weather maps.

Gosport, Fort Brockhurst (Torpedo Section, Artillery Co-op. Unit).—Attack on battleship and convoy. Air drill. Converging bombing. "Pupil and instructor."

Christchurch, Bournemouth (Civil).—Dive bombing and supply dropping by visiting R.A.F. aircraft. Display by civil aircraft.

Hamble, Southampton (Civil).—Service training centre. R.A.F. aircraft co-operating in air display.

Ryde, I.O.W. (Civil).—Air drill, aerobatics, dive bombing and other R.A.F. events. Civil display.

NORFOLK

Marham, Downham Market (2 Bomber Sqns.).—Low bombing attack. Balloon bursting. Aerial target towing. Parachute. Air drill.

Norwich (Civil).—Air drill, aerobatics, target towing, etc. Bircham Newton R.A.F. co-operating. Gliding. Civil air display.

NORTHAMPTONSHIRE

Peterborough (F.T.S.).—Air drill. Parachute dropping. "Pupil and instructor." Bombing raid. A.R.P.

Sywell, Northampton (Civil).—Service training centre. Flight bomb raid, synchronised aerobatics, etc., by visiting R.A.F. aircraft. Civil display.

OXFORDSHIRE

Upper Heyford, Oxford, Ardley or Heyford Stations (2 Bomber Sqns.).—Fighters v. machine guns. Attack on armoured car. Air raid. A.R.P. Gas training for visitors. R/T. bombing.

SUFFOLK

Felixstowe (Reconn. Flying Boat Sqn.).—Marine Aircraft Experimental Station. Fighters. Marine aircraft display. Fighter v. flying boat air battle.

Martlesham, Woodbridge.—Aeroplane and Armament Experimental Station. Dive bombing. Message picking-up. Air battle. R/T. Race. Visit by flying boat.

Mildenhall, Shippes Hill (2 Bomber Sqns.).—R/T. orders to aircraft. Low bomb attack. Raid defence. Race. Civil flights. Parachute.

Stradishall, Newmarket (2 Bomber Sqns.).—R/T. to aircraft by visitors. Dive bombing. Air combat. Race. Attack on motor transport. Balloon-bursting by aircraft.

SUSSEX

***Tangmere,** Chichester (2 Fighter, 1 Reconn. Sqns.).—Quick get-away. Air combat. Raid. Protection of seaborne trade. Drogue firing. R/T. orders by visitors. Message picking-up.

Shoreham (Civil).—Service training centre. R.A.F. co-operating. Air drill. Aerobatics. Attack on airport by bombers and fighters. Message picking-up. Supply dropping. Gliding. Civil display.

PROVINCIAL CENTRES

CUMBERLAND

Carlisle (Civil).—Flights and trial lessons. R.A.F. co-operating in ground exhibits and flying display. Aerobatics. Fly-past by flying boat. Civil display.

* Also open for pre-view and dress rehearsal May 26. Admission charges, etc., as for Empire Day.

CHESHIRE

Sealand, Chester (F.T.S.).—Dive bombing. Attack on towed target. "Pupil and instructor." Air drill. Glider towing. Fly-past by flying boat. Message picking-up. Free flights.

DEVONSHIRE

Mount Batten, Plymouth (Reconn. Flying Boat Sqn.).—Torpedo attack. R/T. orders. Fly-past. Attack on towed target. Attack on power boat.

Crownhill, Plymouth (Civil).—Civil flights. R.A.F. co-operating. Individual and synchronised aerobatics. Practice bombing. Fly-past by flying boats. Civil display.

DORSET

Woodsford, Dorchester (Armament Training Station).—Low bombing. Drogue firing. Air to ground firing. Message and supply. Air drill. Fly-past.

DURHAM

Usworth (Bomber and A.A.F. Fighter Sqns.).—R/T. orders by visitors. Air raid and battle. Air drill. Bombing. Gliding. Supply dropping. Civil flights.

GLOUCESTERSHIRE

Filton (A.A.F. Bomber Sqn.).—Raid. Air drill. Attack on towed target. Message picking-up. Fly-past.

South Cerney, Cirencester (F.T.S.).—Air raid. Drogue firing. Attack on fortified camp. Massed flying. "Pupil and Instructor." Inverted flying. Supply dropping.

LANCASHIRE

Liverpool, Speke (Civil).—A.A.F. Sqn., R.A.F. co-operating. Air drill. Fly-past by flying boat. Target towing. Aerobatics. Air raid. Civil air display.

Stanley Park, Blackpool (Civil).—R.A.F. co-operation. Air combat. Individual aerobatics. Fly-past by flying boat. Civil display.

Barrow-in-Furness (Civil).—Gliding exhibitions, weather permitting.

LEICESTERSHIRE

Leicester (Leicester Airport).—R.A.F. co-operating. Civil display.

LINCOLNSHIRE

Cranwell, Sleaford (R.A.F. Cadet College, Electrical and W/T. School, etc.).—Bombing. Parachute dropping. Message picking-up. R/T. drill. Mass fly-past. Physical training display. "Pupil and instructor."

North Coates, Grimsby, N. Thoresby (Air Observers' School, Armament Training Stn.).—High-speed flying. Raid intercepted. Attack on fort. Bombing. Ground guns v. fighters. Air drill. Supply dropping. Drogue firing.

Sutton Bridge, Holbeach (Armament Training Station).—Attack on ground target. Air combat. Bombing. Air defence. Air drill. Supply dropping. Message picking-up.

Waddington, Lincoln (3 Bomber Sqns., 1 A.A.F.).—A.R.P. A.A. demonstration. Set-piece with Territorials. Dive bombing. Hurricane fighter.

NOTTINGHAM

* **Hucknall,** Nottingham (2 Bomber Sqns., 1 A.A.F.).—Attack on towed target. Raid. A.R.P. Converging attack. Supply dropping. Low bombing. Air drill.

SHROPSHIRE

Ternhill, Shrewsbury (F.T.S.).—Blind flying. Parachute. "Pupil and instructor." Raid. Mass flights. Message picking-up. Bombing. Fly-past.

STAFFORDSHIRE

Meir, Stoke-on-Trent (Civil).—Flight bomb raid, target towing, etc., among events provided by R.A.F. in addition to civil display.

SOMERSET

East Chinnock, Yeovil (Civil).—Gliding exhibition, weather permitting.

WARWICKSHIRE

Castle Bromwich (A.A.F. Bomber Sqn.).—Service Training Centre. R/T. orders by public. Bomb raid and defence. Civil flights.

Ansty, Coventry (Civil).—Raid. Synchronised aerobatics, etc., by visiting R.A.F. Service Training Centre. Civil display.

WILTSHIRE

Hullavington, Chippenham (F.T.S.).—Parachute demonstration. Raid. Air drill. Attack on towed target. Message picking-up. Inverted flying.

Old Sarum, Salisbury (School Army Co-operation).—Gunfire on convoy directed by aircraft R/T. Bombing of troops. Rota flying. Musketry competition for visitors.

YORKSHIRE

Catfoss, Hornsea Bridge, Hull (Armament Training Stn.).—Air-to-ground and Drogue firing. Air raid on defended railway station. Fly-past. Parachuté dropping.

Catterick (Army Co-op. and Fighter Sqns.).—Air combat. Air attack on aircraft directing gunfire. Battles engage enemy raiders. Civil flights.

Church Fenton, Tadcaster (2 Fighter Sqns.).—Attack on transport and troops by massed flights. "Pupil and instructor." Air raid. Air fight. Dive bombing.

Thornaby-on-Tees (A.A.F. and 2 Reconn. Sqns.).—R/T. to aircraft by public. Air battle. "Pupil and instructor." Attack on native village. Bombing. Glider towing. Air drill.

Hedon, Hull (Civil).—Aerobatics. Target towing. Low bombing and ground exhibits by R.A.F. Civil display.

Yeadon, Leeds (Civil).—A.A.F. Sqn., R.A.F. co-operating. Aerobatics. Target towing. Air combat. Air drill. Bombing. Civil display.

Sutton Bank, Thirsk (Civil).—Gliding exhibition, weather permitting.

WALES

CAERNARVON

Penrhos, Pwllheli (Armament Training Station).—Converging bombing. Drogue firing. Air drill. Bombing training.

GLAMORGAN

Cardiff (Civil).—A.A.F. Sqn. Raid. Message picking-up by R.A.F. Civil display. Fly-past of R.A.F. aircraft.

PEMBROKE

Pembroke Dock (Flying Boat Sqns.).—R/T. orders by public. Attack on flying boat. Bombing. Trips in Power Boats. Musketry for visitors. Floating dock.

SCOTLAND

ABERDEENSHIRE

Dyce (Civil).—A.A.F. Squadrons. Aerobatics. Message picking-up. Dive bombing. Civil display.

Angus, Montrose (F.T.S.).—Link trainer. Dive bombing. Gas attack. "Frontier incident." Air drill. R/T. aerobatics.

FIFESHIRE

Leuchars (Flying and Armament Training Station).—Catapult launching. Dive bombing. Attack on towed target. Attack on aircraft-carrier. Civil flights.

MIDLOTHIAN

Turnhouse, Edinburgh (A.A.F. Bomber Sqn.).—Attack on ground target. Raid. Bombing. Air drill to R/T. Flying boats in fly-past.

PERTHSHIRE

Perth (Civil).—F.T.S. for R.A.F. and Reserve. Dive bombing and air drill by R.A.F. aircraft among flying events. Civil display.

RENFREWSHIRE

Abbotsinch, Paisley (Reconn. and A.A.F. Bomber Sqns.).—Air fighting directed by R/T. Raid. Bombing. Air skittles. Air drill. "Pupil and instructor." Fly-past by new types. Civil flights.

ROSS-SHIRE

Evanton (Armament Training Station).—Bombing. Attack on towed target. Air drill. Torpedo and bomb attack on "pirates." Message picking-up. Air control (set-piece).

WIGTOWNSHIRE

West Freugh, Stranraer (Armament Training Station).—Height and speed-judging competition. Bombing a "submarine" by flying boats. Bomb attach on camp. Attack on towed targets. Air drill.

NORTHERN IRELAND

CO. ANTRIM

Aldergrove, Belfast (A.A.F. Bomber Squadron and Armament Training Station).—Quick getaway. Shooting of "prehistoric animals" (set-piece). R/T. drill. Fly-past. Target towing. Message picking-up.

* Also open for pre-view and dress rehearsal, May 26. Admission charges, etc., as for Empire Day.

DUNSTABLE the VENUE for 1938 NATIONAL GLIDING CONTESTS

THIS year, for the first time, the headquarters of the London Gliding Club at Dunstable, Bedfordshire, is to be the stage from which competitors from all parts of the country will make a brief appearance before hurriedly commencing their search for "thermals." Technique in the construction and the flying of sailplanes has improved so much that there will be little likelihood of weather conditions making any day between July 9 and July 17 an uneventful one; a pointer to the advance in knowledge is that marks for duration by means of hill-soaring have been confined to club team entries and have been entirely eliminated, as such, from the open contests.

The rules for the seventh annual contests further serve to mark the strides which the sport is making. A limit of 30 entries has been laid down; the reason may at first escape one, until one reads "to avoid congestion." Here there is food for thought, as well as in the rules governing the method of awarding marks for performance. The regulations state quite casually that no marks will be awarded for flights of under 15 miles when the best flight of the day is under 50 miles, or for under 20 when the best flight is over 50. Also, no heights below 1,500ft. above the starting point will count; the method of awarding marks to heights of over 6,000ft. is then given. Finally, in the duration section, flights of under two hours will not count at all.

To appreciate the full meaning of these rules it is only necessary to remember that it is but a few years since the first motorless flight of any appreciable duration was front-page news. That such rules are now workable is in itself ample proof of the advance in technique in recent years which has been made possible by the perseverance of a comparatively small band of enthusiasts.

There will be contests for the best distance, best height and best duration, with challenge trophies and prizes for performances accomplished during the year and during the actual contests. Bonus marks are offered for flights made to a pre-declared destination. Most difficult of all are the out-and-back competitions, when the pilot must reach a declared turning point and fly back to his starting point. There will also be a series of daily competitions, which will be announced when the meteorological conditions for the day are known.

Launching will be by catapult from the top of the Downs, by winch or by aero-tow. Gliders launched by the latter methods should, however, not score unduly in the height contests, as the rules lay down that the starting point is the actual height of the machine when it is released from the winch cable or aero-towing cable.

As this is the first time that the National Gliding Contests have been held within easy reach of London, extensive preparations are being made to cater for the public. The site at Dunstable forms a natural grandstand for spectators, and every facility is being provided for their comfort. The responsibility for the organisation of the contests has this year been entrusted to the London Gliding Club by the British Gliding Association, and, judging from the present advanced state of this organisation, the success of the meeting appears to be assured.